



**Rockwell
International**

Collins instruction book

Part 2

HF-8054() Receiver

Part 2 of this instruction book includes:

Power Supply	523-0767948	Synthesizer End Decade	523-0767973
LED Status Display	523-0767946	Synthesizer Decade	523-0767972
Frequency Switchboard	523-0767947	Synthesizer Output	523-0767971
DVBFO Switchboard	523-0770518	Receive Audio	523-0767956
Frequency Display	523-0767975	Frequency Standard Switch	523-0770716
AFC	523-0770519	TS-8010 Card Extender Kit	523-0767968
VBFO	523-0770520	Options:	
Channel B1/A2/B2 IF	523-0770708	AC-8012 Oven Standard Kit	523-0768671
Channel A1 IF	523-0770709	AC-8013 External Standard Kit	523-0768672
Filter	523-0767967	AC-8014 Frequency Display Kit	523-0770521
RF Translator	523-0767959	AC-8015 Frequency Switch Kit	523-0770717
Control	523-0770710	AC-8017/8017A 100- to 10-Hz	
Parallel Input	523-0770711	Conversion Kit	523-0768676
Parallel Output	523-0770712	AC-8018 10- to 1-Hz	
Serial Interface	523-0770713	Conversion Kit	523-0768673
Synthesizer Voltage Regulator	523-0767974	AC-8019 100- to 1-Hz	
Synthesizer Subcarrier		Conversion Kit	523-0768677
Generator	523-0770714	AC-8055 IF Filters Kit	523-0768674
Synthesizer Reference	523-0770715		

**Collins Telecommunications
Products Division
Electronic Systems Group
Rockwell International
Cedar Rapids, Iowa 52406**



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Generator	523-0770714	AC-8055 IF Filters Kit	523-0768674
Synthesizer Reference	523-0770715		

**Collins Telecommunications
Products Division
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Rockwell International
Cedar Rapids, Iowa 52406**

Caution

The material in this manual is subject to change. Before attempting any maintenance operation on the equipment covered in this manual, verify that you have a complete and up-to-date publication applicable to your equipment.

Please be advised that completion of the enclosed Automatic Distribution Service Card and return to Rockwell International ensures you of manual revisions and service bulletin modifications to your equipment. Without the return of this card, Rockwell International bears no responsibility to forward this information to you.

We welcome your comments concerning this instruction book. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the instruction book part number, the paragraph or figure number, and the page number.

Send your comments to: Logistics
Collins Telecommunications
Products Division
Rockwell International
Cedar Rapids, Iowa 52406

ATTN: Quality Control-Support Engineering 179-200



**Rockwell
International**

instructions

Collins Telecommunications Products Division

523-0767948-202211

2nd Edition, 1 June 1978

2nd Revision, 1 January 1981

Power Supply (635-9649-001)

Printed in USA

1. DESCRIPTION

Power Supply 635-9649-001, shown in figure 1, is a module that contains a power transformer, a 2-section input power strapping switch, six power regulators, and a planar circuit card with full-wave rectifiers and an output fault circuit.

The power supply module consists of four primary functional areas: input power switching, power transformer and rectifiers, regulators, and the output fault summary circuit. Refer to figure 2 for a block diagram of the power supply module.

2. PRINCIPLES OF OPERATION

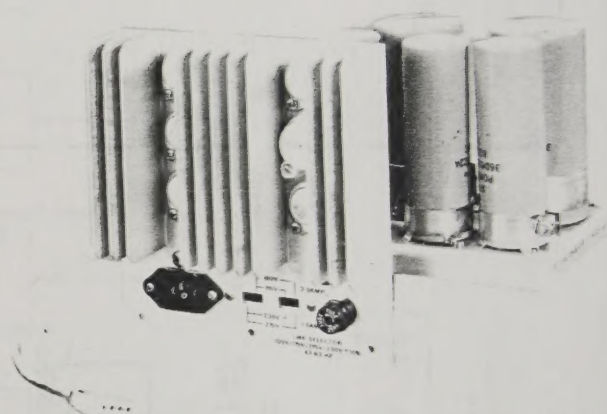
2.1 General

This power supply is fuse protected (2 A for 100/115 V ac; 1 A for 215/230 V ac) and supplies a loss-of-output fault indication. The input power is switchable between 100-, 115-, 215-, and 230-V ac single phase. Output voltages supplied are +24, +18, +15, +8, +5, and -15 V dc.

2.2 Input Power Switching (Refer to figure 3.)

The input power circuit consists of a fuse protector, power on-off switch S2, power control switch S1, and power transformer T1.

Note that power control switch S1 is a dual switch having two 2-position switches. S1A (low pin numbers) selects between series connection (215, 230 V ac) and parallel connection (110, 115 V ac) of transformer T1. S1B (high pin numbers) selects between less-turns ratio (115, 230 V ac) and more-turns ratio (110, 215 V ac) of transformer T1.



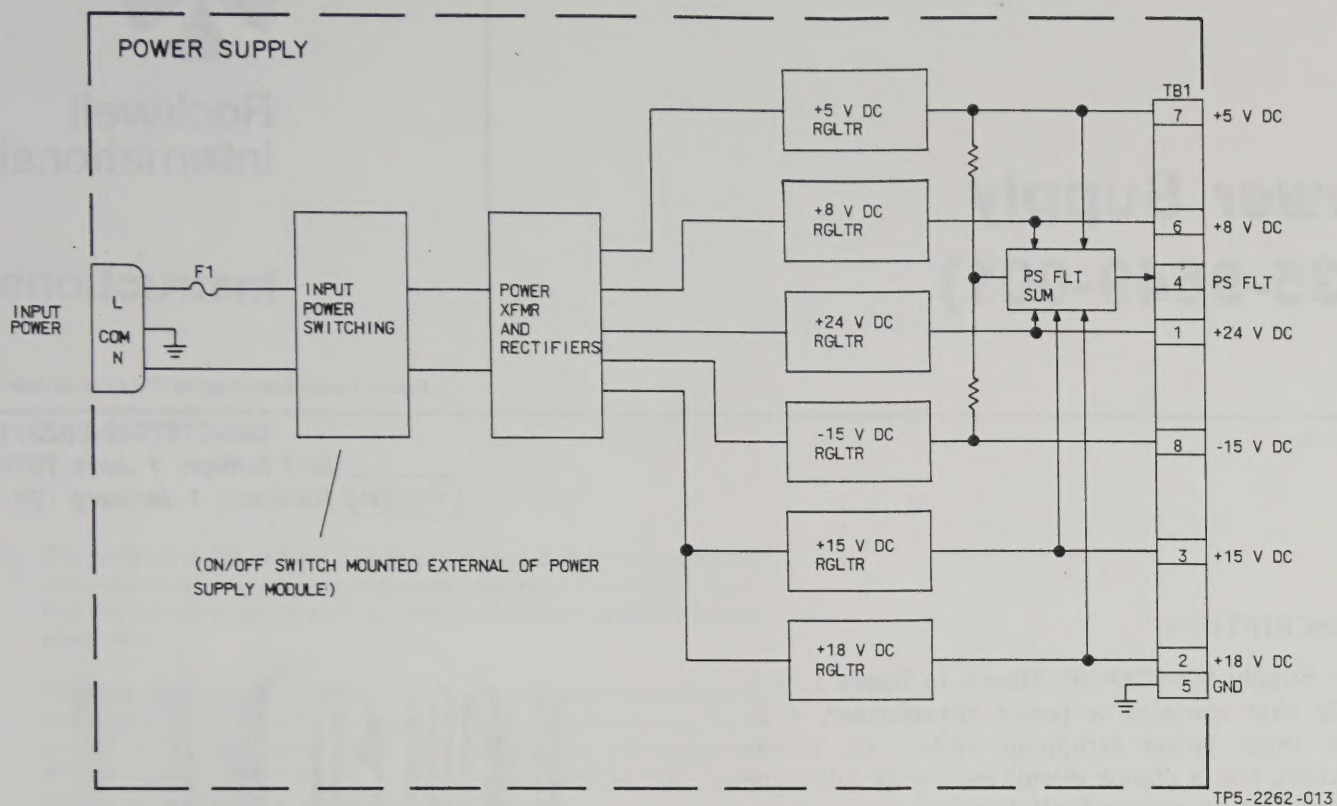
Power Supply
Figure 1

2.3 Power Transformer, Rectifiers, and Regulators (Refer to figure 4.)

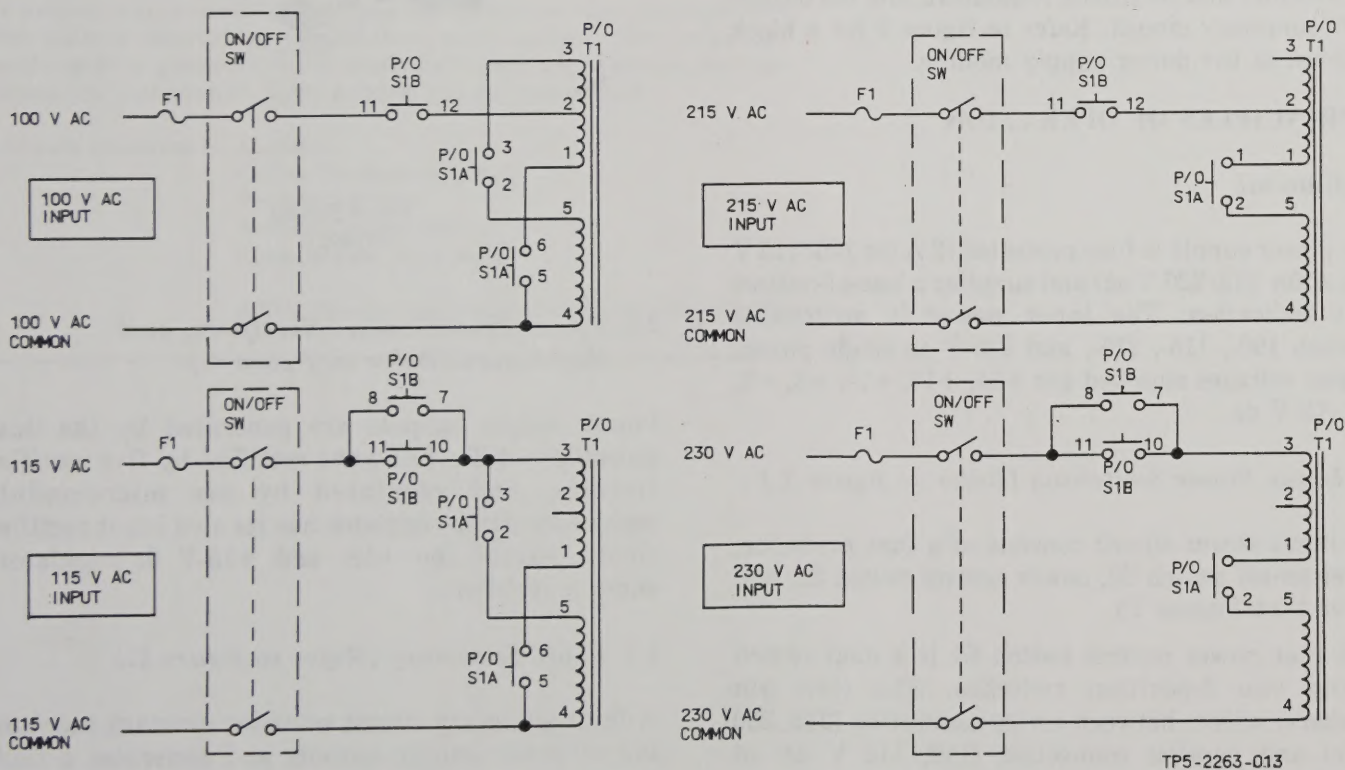
Power supply outputs are generated by the dual secondary of T1, full-wave rectified by five rectifier circuits, and regulated by six micromodule regulators. Each regulator has its own input rectifier circuit, except the +18- and +15-V dc regulators share a rectifier.

2.4 Fault Summary (Refer to figure 5.)

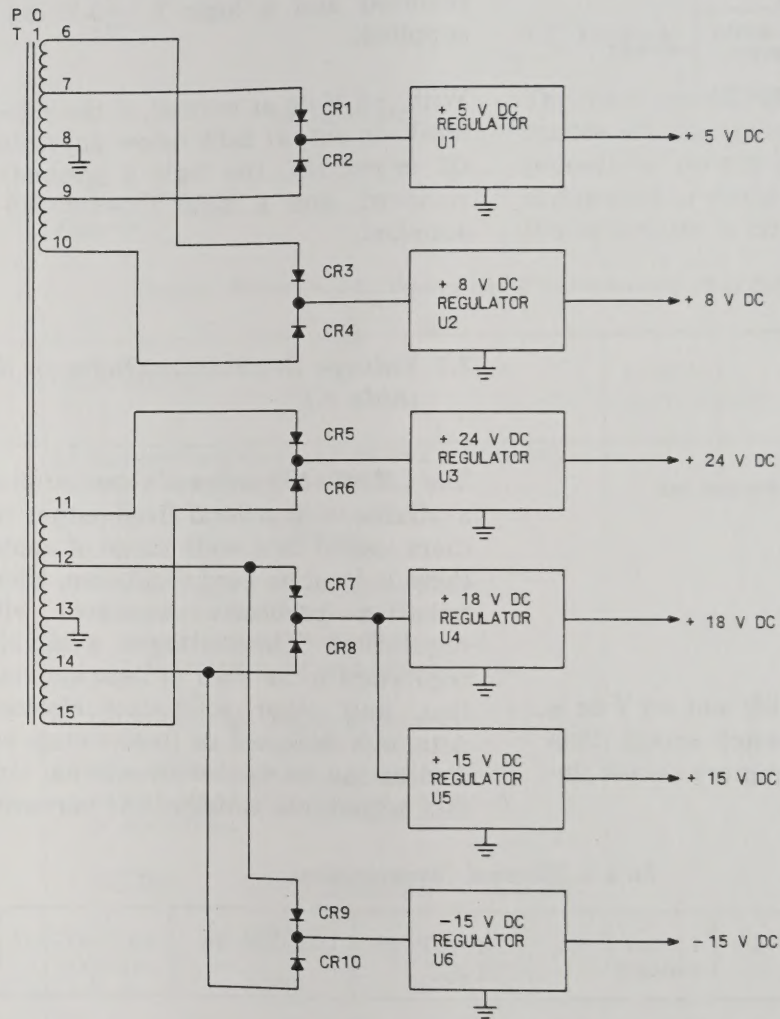
A fault summary circuit provides constant monitoring of power supply outputs and generates a fault output if any positive output drops below +5 V dc or if the negative output goes any more positive than -5 V dc.



Power Supply, Block Diagram
Figure 2

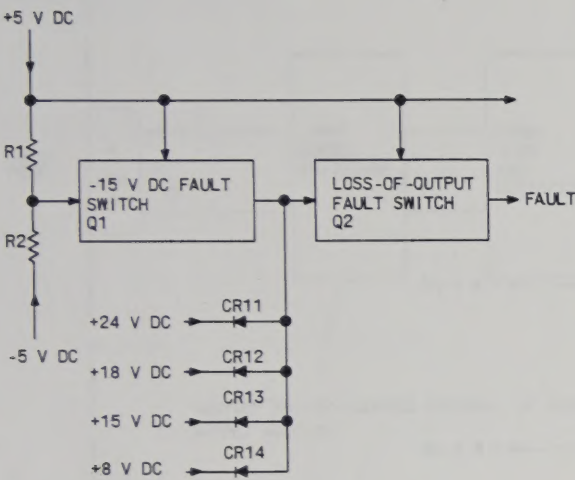


Input Power Transformer Switching
Figure 3



TP5-2260-013

Power Transformer, Rectifiers, and Regulators
Figure 4



TP5-2261-013

Fault Summary
Figure 5

With all outputs normal, Q1 is cut off and +5 V dc is supplied through R4 and R6 to switch on Q2. This provides a logic 0 (ground) fault summary output, indicating all supplies are operating.

If the +5-V dc output decreases to a level low enough to cut off Q2, the logic 0 (ground) fault signal is removed and a logic 1 (open circuit) fault signal is supplied.

With +5 V dc at normal, if the -15-V dc output goes positive to a level at approximately -5 V dc or less, Q1 switches on and supplies a ground signal through R6 to cut off Q2. The logic 0 (ground) fault signal is removed and a logic 1 (+5-V dc) fault signal is supplied.

With +5 V dc at normal, if the +24-, +18-, +15-, or +8-V dc output falls below approximately +5 V dc, Q2 is cut off, the logic 0 (ground) fault signal is removed, and a logic 1 (+5-V dc) fault signal is supplied.

2.5 Voltage Regulators (Refer to figure 6 and to table 1.)

The LM340/320 series of three terminal regulators is available with several fixed output voltages, making them useful in a wide range of applications. One of these is local on-card regulation, eliminating the distribution problems associated with single-point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, and other solid-state electronic equipment. Although designed as fixed-voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Table 1. Electrical Characteristics.

CHARACTERISTIC	LM340T-5/ 7805KC	LM340T-8/ 7808KC	LM340T-15/ 7815KC	LM320K-15	LM340T-18/ 7818KC	LM340T-24/ 7824KC
Max input voltage	35 V (except LM340T-24, 40 V)					
Operating temperature	0 to -70 °C (-32 to -158 °F)					
Storage temperature	-65 to -150 °C (-85 to -302 °F)					
Line regulation						
100 mA out	50 mV max	80 mV max	150 mV max	150 mV max	180 mV max	240 mV max
500 mA out	100 mV max	160 mV max	300 mV max	300 mV max	360 mV max	480 mV max
Output voltage	4.75 V min 5.25 V max	7.6 V min 8.4 V max	14.25 V min 15.75 V max	14.25 V min 15.75 V max	17.1 V min 18.9 V max	22.8 V min 25.2 V max
Ripple rejection	60 dB typical	55 dB typical	50 dB typical	50 dB typical	48 dB typical	44 dB typical

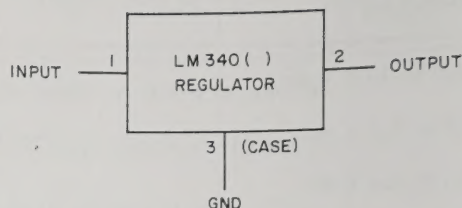
3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the power supply module are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 2 check total performance of the power supply module. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.



TP5-2377-012

Voltage Regulator
Figure 6

Table 2. Power Supply, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																					
1. Setup	a. Remove bottom cover of unit containing power supply to be tested. Note For a quick check these loads need not be installed. Leave power supply connected in unit and perform all test procedures. b. Disconnect all output leads from A1TB1. c. Connect the following loads between A1TB1 pins indicated and A1TB1-5 (black wire). <table><tr><th>A1TB1-</th><th>(WIRE COLOR)</th><th>LOAD</th></tr><tr><td>7</td><td>(violet)</td><td>5 Ω</td></tr><tr><td>6</td><td>(blue)</td><td>10 Ω</td></tr><tr><td>1</td><td>(brown)</td><td>40 Ω</td></tr><tr><td>2</td><td>(red)</td><td>22 Ω</td></tr><tr><td>3</td><td>(orange)</td><td>15 Ω</td></tr><tr><td>8</td><td>(gray)</td><td>22 Ω</td></tr></table>	A1TB1-	(WIRE COLOR)	LOAD	7	(violet)	5 Ω	6	(blue)	10 Ω	1	(brown)	40 Ω	2	(red)	22 Ω	3	(orange)	15 Ω	8	(gray)	22 Ω		
A1TB1-	(WIRE COLOR)	LOAD																						
7	(violet)	5 Ω																						
6	(blue)	10 Ω																						
1	(brown)	40 Ω																						
2	(red)	22 Ω																						
3	(orange)	15 Ω																						
8	(gray)	22 Ω																						
2. LINE SELECTOR switch	a. Connect power supply to 50-V ac source and set power on. b. Measure dc voltage at A1E5 with LINE SELECTOR switch set at each of the following positions: 100 V		Check CR5, CR6, S1A, S1B, and T1.																					
(Cont)		11.8 to 16.0 V dc																						

Table 2. Power Supply, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	115 V 215 V 230 V c. Set power off and remove 50-V ac source.	13.0 to 14.0 V dc 6.9 to 7.5 V dc 6.5 to 7.0 V dc	
3. Output voltage	a. Connect power supply to 103-V ac source. b. Set LINE SELECTOR switch to 115 V and set power on. c. Measure dc voltage at each of the following outputs: <u>A1TB1-</u> 7 (+5 V) 6 (+8 V) 1 (+24 V) 2 (+18 V) 3 (+15 V) 8 (-15 V) d. Set power off. Disconnect 103-V ac source and connect power supply to 127-V ac source. e. Set power on and measure dc voltage at each of the following outputs: <u>A1TB1-</u> 7 (+5 V) 6 (+8 V) 1 (+24 V) 2 (+18 V) 3 (+15 V) 8 (-15 V) f. Set power off and disconnect 127-V ac source.	+4.8 to +5.2 V dc. +7.6 to +8.4 V dc. +23 to +25 V dc. +15.5 to +18.7 V dc. +14.4 to +15.6 V dc. -14.6 to -15.4 V dc. +4.8 to +5.2 V dc. +7.6 to +8.4 V dc. +23 to +25 V dc. +17.3 to +18.7 V dc. +14.4 to +15.6 V dc. -14.6 to -15.6 V dc.	Check the following components and circuits associated with each: U1, CR1, CR2, and T1. U2, CR3, CR4, and T1. U3, CR5, CR6, and T1. U4, CR7, CR8, and T1. U5, CR7, CR8, and T1. U6, CR9, CR10, and T1. U1, CR1, CR2, and T1. U2, CR3, CR4, and T1. U3, CR5, CR6, and T1. U4, CR7, CR8, and T1. U5, CR7, CR8, and T1. U6, CR9, CR10, and T1.

Table 2. Power Supply, Testing and Troubleshooting Procedures (Cont).

PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
a. Connect power supply to 103-V ac source. b. Set LINE SELECTOR switch to 115 V and set power on. c. Measure ac ripple voltage at each of the following outputs: <u>A1TB1-</u> 7 (-5 V) 6 (-8 V) 1 (-24 V) 2 (-18 V) 3 (+15 V) 8 (-15 V) d. Set power off. Disconnect 103-V ac source and connect power supply to 127-V ac source. e. Set power on and measure ac ripple voltage at each of the following outputs: <u>A1TB1-</u> 7 (+5 V) 6 (+8 V) 1 (+24 V) 2 (+18 V) 3 (+15 V) 8 (-15 V) f. Set power off and disconnect 127-V ac source.	NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 350 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV. NMT 5 mV.	Check the following components and circuits associated with each. C14, CR1, CR2, and T1. C15, CR3, CR4, and T1. C16, CR5, CR6, and T1. C17, CR7, CR8, and T1. C18, CR7, CR8, and T1. C18, CR9, CR10, and T1. C14, CR1, CR2, and T1. C15, CR3, CR4, and T1. C16, CR5, CR6, and T1. C17, CR7, CR8, and T1. C18, CR7, CR8, and T1. C19, CR9, CR10, and T1.

Table 2. Power Supply, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. Fault	a. Connect power supply to 103-V ac source. b. Set LINE SELECTOR switch to 115 V and set power on. c. Measure dc output voltage at A1TB1-4 (fault) as each of the following dc output voltages is shorted to A1TB1-5 (ground). Note Only one short applied at a time. <u>A1TB1-</u> 7 (+5 V) 6 (+8 V) 1 (+24 V) 2 (+18 V) 3 (+15 V) 8 (-15 V) d. Measure dc output voltage at A1TB1-4 (fault) with no shorted outputs applied. e. Check that all output voltages are restored when shorts are removed. f. Set power off and disconnect 103-V ac source.	Note There is no +5-V dc output fault indication in the power supply. +5-V dc output fault indicated by associated control card circuits and front-panel indicator. NMT 0.10 V dc. +4.5 to +5.5 V dc. +4.5 to +5.5 V dc. +4.5 to +5.5 V dc. +4.5 to +5.5 V dc. +4.5 to +5.5 V dc. +4.5 to +5.5 V dc. NMT 0.2 V dc.	Check the following components and circuits associated with each. R5, Q2, and Q1. CR14. CR11. CR12. CR13. R1 and Q1. R2, Q1, R4, R6, R3, and Q2.
6. Transformer regulation	a. Remove all output loads. b. Connect power supply to 125-V ac source. c. Set LINE SELECTOR switch to 115 V and set power on. d. Measure dc voltage at CR5 and CR6 cathode. e. Set power off and disconnect 127-V ac source.	NMT 45.0 V dc.	Check T1 and associated circuits.

4. REPAIR

Repair of the power supply module is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

5. PARTS LIST/DIAGRAMS

5.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and also in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 7). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

5.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column

of the parts list in parentheses, and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
13103	THERMALLOY CO INC 2021 W VALLEY VIEW LANE P O BOX 34829 DALLAS TX 75234
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV PO BOX 728 855 35TH STREET NE CEDAR RAPIDS IA 52406
14099	SEMTECH CORP 652 MITCHELL ROAD NEWBURY PARK CA 91320
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051

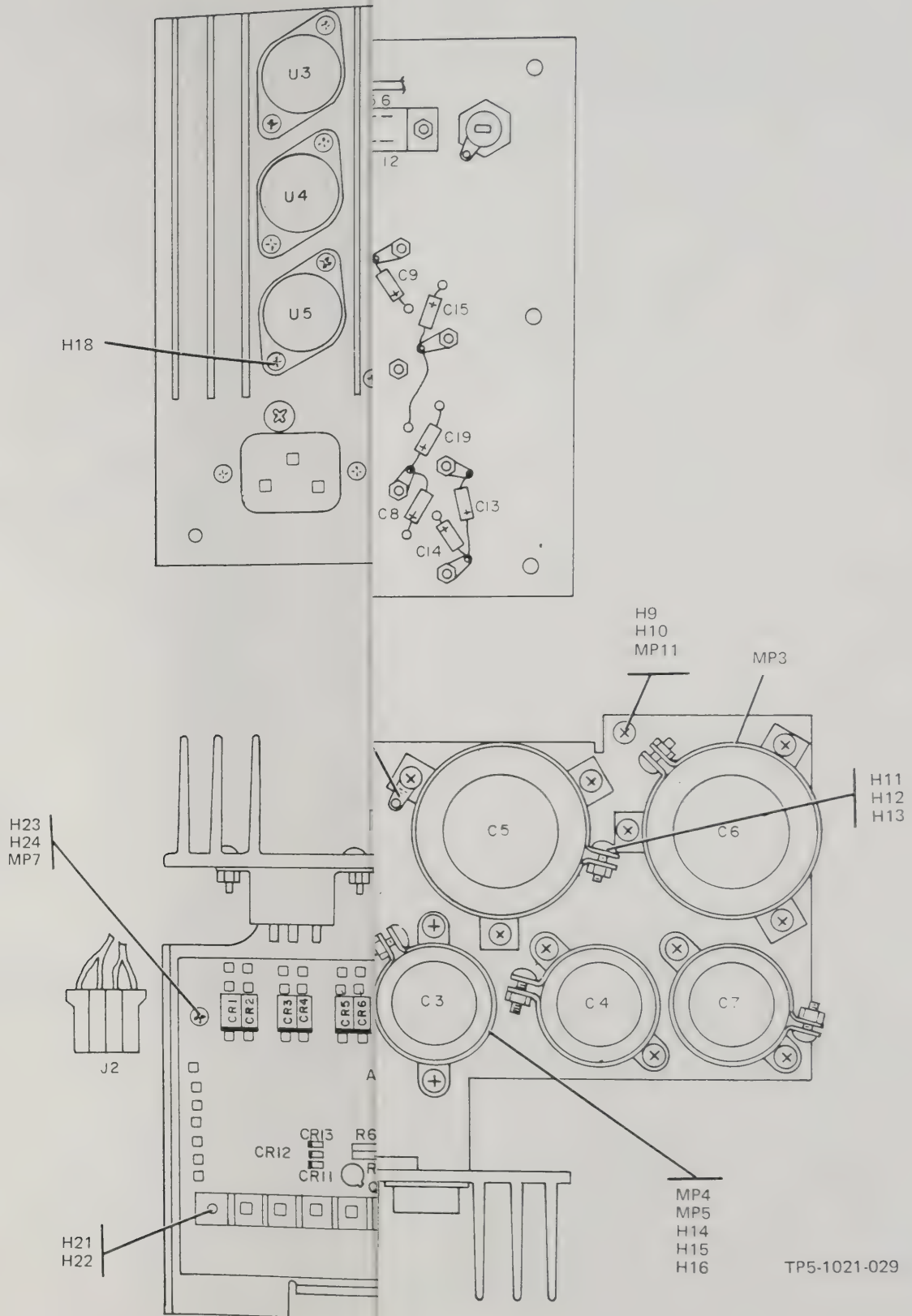
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
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56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
71400	BUSSMANN MFG DIV MCGRAW-EDISON CO 502 EARTH CITY PLAZA P O BOX 14460 ST LOUIS MO 63178
71785	TRW CINCH CONNECTORS 1501 MORSE AVE ELK GROVE VILLAGE IL 60007
77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905
77250	PHEOLL MFG CO DIV OF ALLIED PRODUCTS CORP 5700 W ROOSEVELT RD CHICAGO IL 60650
79807	WROUGHT WASHER MFG INC 2100 S O BAY ST MILWAUKEE WI 53207
80205	NATIONAL AEROSPACE STANDARDS COMMITTEE AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA INC 1725 DE SALES N W WASHINGTON DC 20036
81349	MILITARY SPECIFICATION
82389	SWITCHCRAFT INC SUB OF RAYTHEON CO 5555 N ELSTON AVE CHICAGO IL 60630
91314	LEWIS SPRING AND MFG CO 2652 W NORTH AVE CHICAGO IL 60647
91886	MALCO A MICRODOT CO 12 PROGRESS DR MONTGOMERYVILLE PA 18936
96906	MILITARY STANDARD
98330	POLYPHASE INSTRUMENT CO E FOURTH ST BRIDGEPORT PA 19405

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Power Supply	635-9649-001	REV E
Power Supply Card	635-0903-001	REV B



Power Supply, Schematic Diagram
Figure 7 (Sheet 1 of 3)

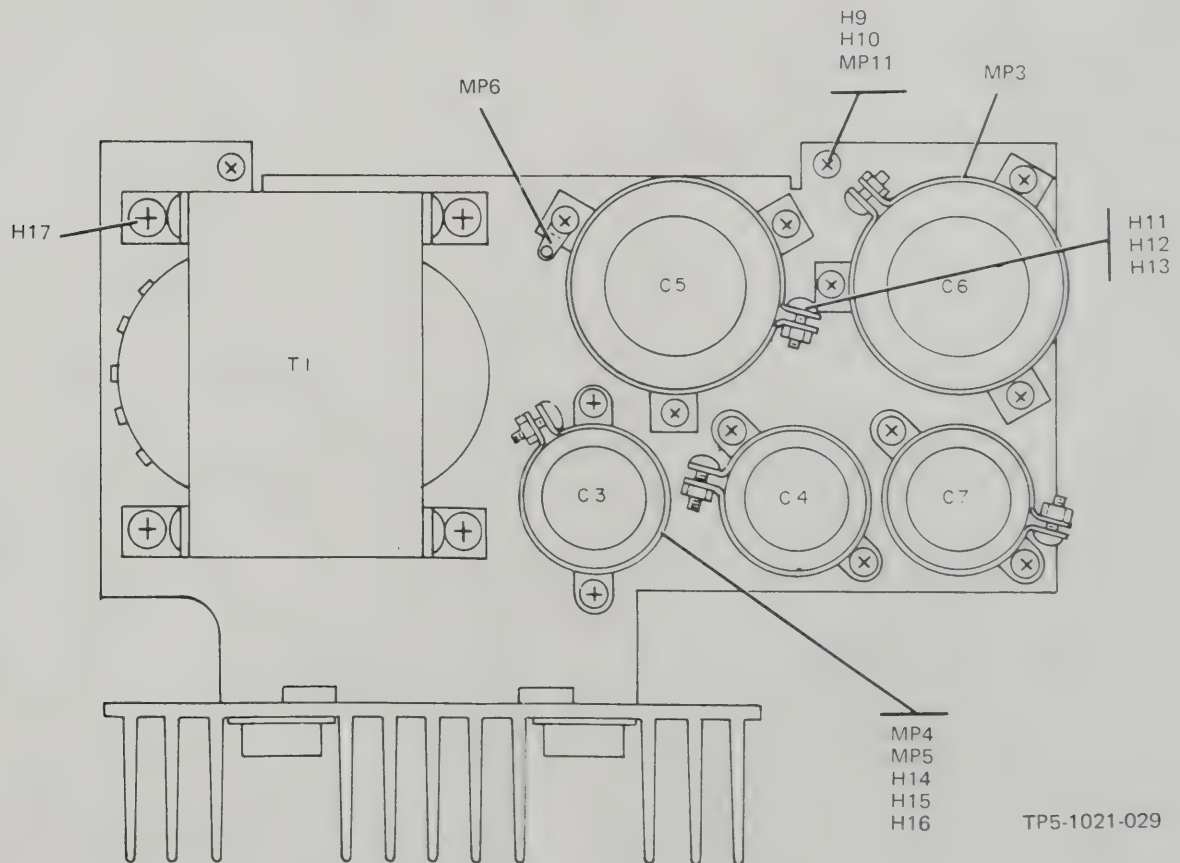
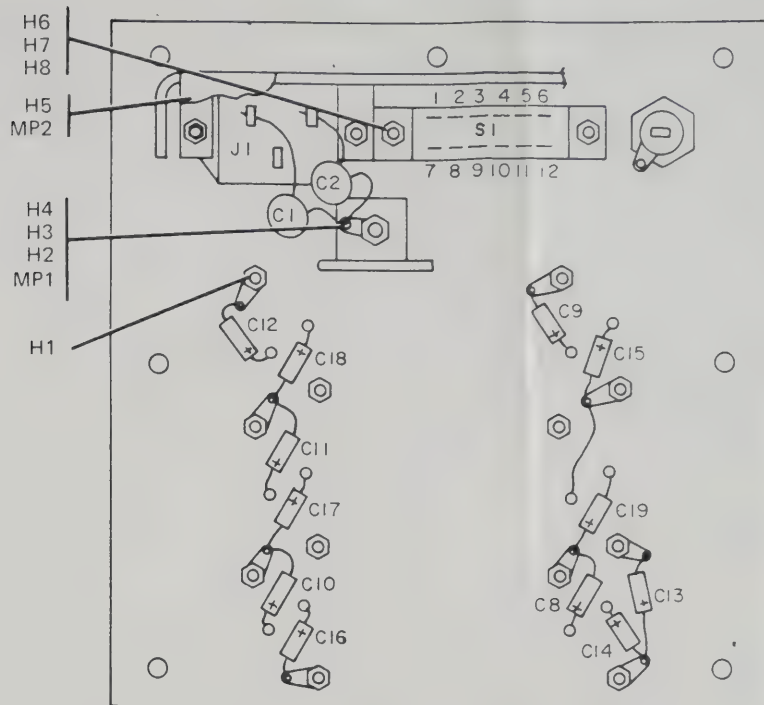
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
-------------	------------------------------------

56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
71400	BUSSMANN MFG DIV MCGRAW-EDISON CO 502 EARTH CITY PLAZA P O BOX 14460 ST LOUIS MO 63178
71785	TRW CINCH CONNECTORS 1501 MORSE AVE ELK GROVE VILLAGE IL 60007
77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905
77250	PHEOLL MFG CO DIV OF ALLIED PRODUCTS CORP 5700 W ROOSEVELT RD CHICAGO IL 60650
79807	WROUGHT WASHER MFG INC 2100 S O BAY ST MILWAUKEE WI 53207
80205	NATIONAL AEROSPACE STANDARDS COMMITTEE AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA INC 1725 DE SALES N W WASHINGTON DC 20036
81349	MILITARY SPECIFICATION
82389	SWITCHCRAFT INC SUB OF RAYTHEON CO 5555 N ELSTON AVE CHICAGO IL 60630
91314	LEWIS SPRING AND MFG CO 2652 W NORTH AVE CHICAGO IL 60647
91886	MALCO A MICRODOT CO 12 PROGRESS DR MONTGOMERYVILLE PA 18936
96906	MILITARY STANDARD
98330	POLYPHASE INSTRUMENT CO E FOURTH ST BRIDGEPORT PA 19405

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Power Supply	635-9649-001	REV E
Power Supply Card	635-0903-001	REV B



Power Supply, Schematic Diagram
Figure 7 (Sheet 1 of 3)

PARTS LIST

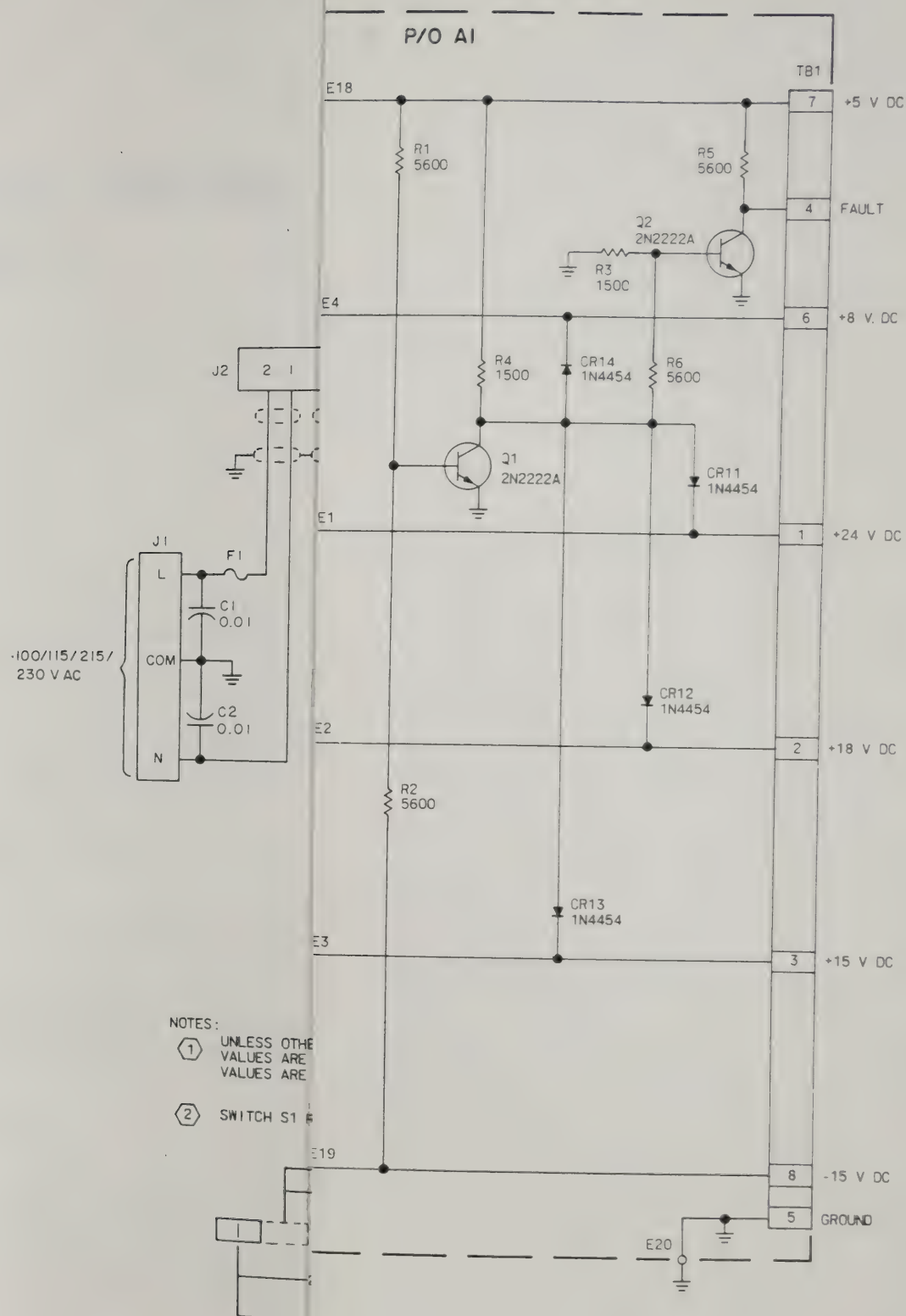
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
A1	POWER SUPPLY	635-9649-001		
C1,C2	POWER SUPPLY CARD	635-0903-001		56289
C3	CAPACITOR,FXD CER DIEL, 10000PF, 20%, 500V	913-3013-000		56289
	CAPACITOR,FXD ELCTLT, 13000UF, P100%M10%, 15VDC	183-1278-080		
C4	CAPACITOR,FXD ELCTLT, 8200UF, 40%, 50V	183-1278-580		56289
C5	CAPACITOR,FXD ELCTLT, 9000UF, P100%M10%, 50V	183-1278-380		56289
C6	CAPACITOR,FXD ELCTLT, 12000UF, P100%M10%, 40VDC	183-1278-190		56289
C7	CAPACITOR,FXD ELCTLT, 8200UF, 40%, 50V	183-1278-580		56289
C8-C19	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 50V	184-9087-560		81349
H1	SCREW,MACH NP BRS, 6-32 X 1/2 (QTY 2)	343-0332-000		77250
H2	SCREW,MACH SST, 10-32 X 1/2 (QTY 6)	343-0228-000		96906
H3	WASHER,LOCK SST, 0.194 ID X 0.334 OD (QTY 14)	310-0284-000		96906
H4	NUT,PLAIN,HEX SST, 10-32 (QTY 2)	313-0019-000		96906
H5	SCREW,MACH STL, 4-40 X 7/16 (QTY 2)	343-0136-000		96906
H6	SCREW,MACH SST, 4-40 X 5/16 (QTY 2)	343-0134-000		96906
H7	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 2)	310-0279-000		96906
H8	NUT,PLAIN,HEX SST, 4-40 (QTY 2)	313-0132-000		77250
H9	SCREW,MACH SST, 6-32 X 5/8 (QTY 2)	343-0173-000		96906
H10	WASHER,FLAT BRS, 0.147 ID X 0.312 OD (QTY 18)	310-0055-000		79807
H11	SCREW,MACH SST, 6-32 X 1/2 (QTY 2)	343-0171-000		96906
H12	WASHER,LOCK SST, 0.150 ID X 0.317 OD (QTY 5)	373-8020-000		96906
H13	NUT,PLAIN,HEX CRES,6-32 (QTY 5)	313-0002-000		96906
H14	SCREW,MACH NP BRS, 6-32 X 3/8 (QTY 12)	343-0330-000		77250
H15	NUT,PLAIN,HEX NP BRS, 6-32 (QTY 26)	313-0140-000		77250
H16	WASHER,LOCK BRZ, 0.141 ID X 0.239 OD (QTY 28)	310-0078-000		79807
H17	WASHER,FLAT PSVT CRES, 0.195 ID X 0.354 OD (QTY 4)	310-0740-520		80205
H18	SCREW,MACH NP BRS, 6-32 X 7/16 (QTY 10)	343-0331-000		77250
H19	SCREW,MACH NP BRS, 10-32 X 1/4 (QTY 10)	343-0343-000		77250
H20	WASHER,LOCK BRZ, 0.194 ID X 0.323 OD (QTY 10)	310-0081-000		79807
H21	SCREW,MACH SST, 6-32 X 1/2 (QTY 5)	343-0171-000		96906
H22	NUT,PLAIN,HEX SST, 6-32 (QTY 4)	313-0045-000		77250
H23	SCREW,MACH SST, 10-32 X 3/8 (QTY 4)	343-0226-000		96906
H24	WASHER,FLAT BRS, 0.203 ID X 0.437 OD (QTY 4)	310-0059-000		79807
J1	CONNECTOR,RCPT ELEC	368-0385-010		82389
J2	HOUSING,SOCKET	372-5884-490		00779
MP1	TERMINAL,LUG (QTY 1)	304-1466-010		91886
MP2	COVER, CONN	635-9618-001		
MP3	CLAMP, MTG (QTY 2)	139-1183-000		56289
MP4	RETAINER, CAP (QTY 3)	139-3284-000		56289
MP5	TERMINAL,LUG (QTY 12)	304-0016-000		77147
MP6	TERMINAL,LUG (QTY 10)	304-1259-000		96906
MP7	POST, HEX (QTY 4)	540-9540-003		
MP8	COVER,XSTR	352-9107-010		13103
MP9	BUSHING,INSULATOR (QTY 2)	547-8177-014		
MP10	HEATSINK, POWER SUPPLY	635-9613-001		
MP11	RING,RETAINING (QTY 2)	340-0641-000		91314
S1	SWITCH,SLIDE	266-0217-030		82389
T1	TRANSFORMER,PWR	662-0605-010		98330
U1	REGULATOR,VOLT	351-1342-010		07263
U2	INTEGRATED CIRCUIT REGULATOR	351-1120-100		07263
U3	INTEGRATED CIRCUIT REGULATOR	351-1120-140		07263
U4	INTEGRATED CIRCUIT REGULATOR	351-1120-130		07263
U5	INTEGRATED CIRCUIT REGULATOR	351-1120-120		07263
U6	INTEGRATED CIRCUIT REGULATOR	351-1124-030		27014
XF1	FUSEHOLDER	265-1171-000		71400
	POWER SUPPLY CARD A1	635-0903-001		
CR1-CR10	SEMICOND DEVICE	353-3718-040		14099
CR11-	SEMICOND DEVICE	353-3644-010		03508
CR14				
Q1,Q2	TRANSISTOR	352-0661-020		07263
R1,R2	RESISTOR,FXD CMPSN, 5.6K, 10%, 1/4W	745-0776-000		81349
R3,R4	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/4W	745-0755-000		81349
R5,R6	RESISTOR,FXD CMPSN, 5.6K, 10%, 1/4W	745-0776-000		81349
TB1	TERMINAL,BOARD	367-1599-070		71785

ic Diagram
2)

Revised 1 January 1981

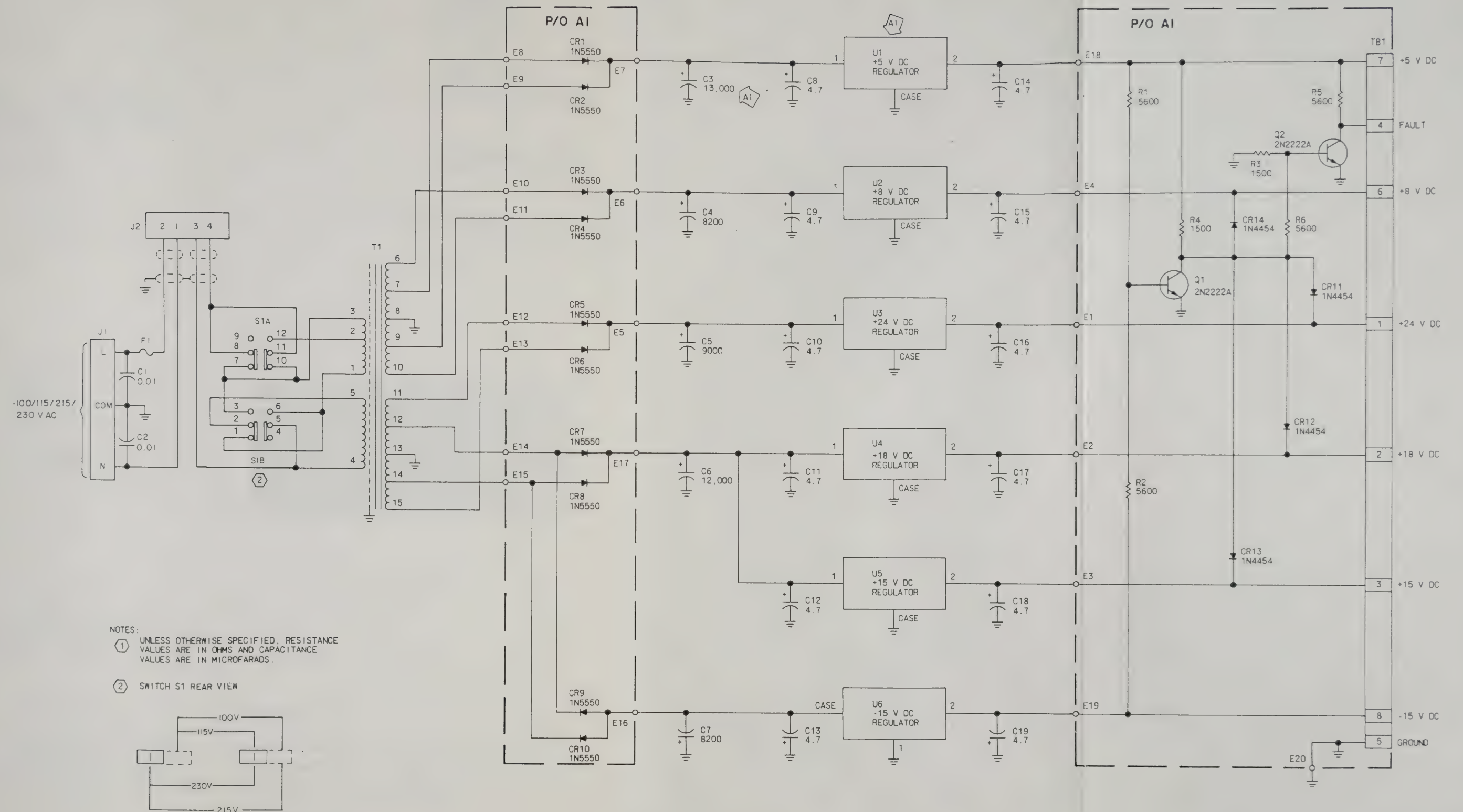
PARTS LIST						MODIFICATION HISTORY		
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	POWER SUPPLY	635-9649-001			635-9649-001	A1	Changed:	
C1,C2	POWER SUPPLY CARD	635-0903-001			635-0903-001		C3 from 10,000 μ F to 13,000 μ F	635-9649-001
C3	CAPACITOR,FXD CER DIEL, 10000PF, 20%, 500V	913-3013-000		56289	36C175A		U1 from type 7805KC to	REV E and
	CAPACITOR,FXD ELCTLT, 13000UF, P100%M10%, 15VDC	183-1278-080		56289	36D133G015AC2B		type UA78H05SC	above
C4	CAPACITOR,FXD ELCTLT, 8200UF, 40%, 50V	183-1278-580		56289	36DX822G040AC2A			
C5	CAPACITOR,FXD ELCTLT, 9000UF, P100%M10%, 50V	183-1278-380		56289	36D902G050BC2A			
C6	CAPACITOR,FXD ELCTLT, 12000UF, P100%M10%, 40VDC	183-1278-190		56289	36D123G040BC2B			
C7	CAPACITOR,FXD ELCTLT, 8200UF, 40%, 50V	183-1278-580		56289	36DX822G040AC2A			
C8-C19	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 50V	184-9087-560		81349	M390C3-01-2369			
H1	SCREW,MACH NP BRS, 6-32 X 1/2 (QTY 2)	343-0332-000		77250	P343-0332-000			
H2	SCREW,MACH SST, 10-32 X 1/2 (QTY 6)	343-0228-000		96906	MS51958-63			
H3	WASHER,LOCK SST, 0.194 ID X 0.334 OD (QTY 14)	310-0284-000		96906	MS35338-138			
H4	NUT,PLAIN,HEX SST, 10-32 (QTY 2)	313-0019-000		96906	MS35650-304			
H5	SCREW,MACH STL, 4-40 X 7/16 (QTY 2)	343-0136-000		96906	MS1957-16			
H6	SCREW,MACH SST, 4-40 X 5/16 (QTY 2)	343-0134-000		96906	MS1957-14			
H7	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 2)	310-0279-000		96906	MS35338-135			
H8	NUT,PLAIN,HEX SST, 4-40 (QTY 2)	313-0132-000		77250	P313-0132-000			
H9	SCREW,MACH SST, 6-32 X 5/8 (QTY 2)	343-0173-000		96906	MS1957-31			
H10	WASHER,FLAT BRS, 0.147 ID X 0.312 OD (QTY 18)	310-0055-000		79807	310-0055-000			
H11	SCREW,MACH SST, 6-32 X 1/2 (QTY 2)	343-0171-000		96906	MS1957-30			
H12	WASHER,LOCK SST, 0.150 ID X 0.317 OD (QTY 5)	373-8020-000		96906	MS35335-58			
H13	NUT,PLAIN,HEX CRES,6-32 (QTY 5)	313-0002-000		96906	MS35649-264			
H14	SCREW,MACH NP BRS, 6-32 X 3/8 (QTY 12)	343-0330-000		77250	P343-0330-000			
H15	NUT,PLAIN,HEX NP BRS, 6-32 (QTY 26)	313-0140-000		77250	P313-0140-000			
H16	WASHER,LOCK BRZ, 0.141 ID X 0.239 OD (QTY 28)	310-0078-000		79807	310-0078-000			
H17	WASHER,FLAT PSVT CRES, 0.195 ID X 0.354 OD (QTY 4)	310-0740-520		80205	NA5620C10L			
H18	SCREW,MACH NP BRS, 6-32 X 7/16 (QTY 10)	343-0331-000		77250	P343-0331-000			
H19	SCREW,MACH NP BRS, 10-32 X 1/4 (QTY 10)	343-0343-000		77250	P343-0343-000			
H20	WASHER,LOCK BRZ, 0.194 ID X 0.323 OD (QTY 10)	310-0081-000		79807	310-0081-000			
H21	SCREW,MACH SST, 6-32 X 1/2 (QTY 5)	343-0171-000		96906	MS1957-30			
H22	NUT,PLAIN,HEX SST, 6-32 (QTY 4)	313-0045-000		77250	P313-0045-000			
H23	SCREW,MACH SST, 10-32 X 3/8 (QTY 4)	343-0226-000		96906	MS1958-61			
H24	WASHER,FLAT BRS, 0.203 ID X 0.437 OD (QTY 4)	310-0059-000		79807	310-0059-000			
J1	CONNECTOR,RCPT ELEC	368-0385-010		82389	EAC301			
J2	HOUSING,SOCKET	372-5884-490		00779	1-480424-0			
MP1	TERMINAL,LUG (QTY 1)	304-1466-010		91886	2115			
MP2	COVER, CONN	635-9618-001						
MP3	CLAMP, MTG (QTY 2)	139-1183-000		56289	4586-48			
MP4	RETAINER, CAP (QTY 3)	139-3284-000		56289	4586-97A			
MP5	TERMINAL,LUG (QTY 12)	304-0016-000		77147	4007-6MT			
MP6	TERMINAL,LUG (QTY 10)	304-1259-000		96906	MS25036-103			
MP7	POST, HEX (QTY 4)	540-9540-003			540-9540-003			
MP8	COVER,XSTR	352-9107-010		13103	8903NM			
MP9	BUSHING,INSULATOR (QTY 2)	547-8177-014			547-8177-014			
MP10	HEATSINK, POWER SUPPLY	635-9613-001						
MP11	RING,RETAINING (QTY 2)	340-0641-000		91314	340-0641-000			
S1	SWITCH,SLIDE	266-0217-030		82389	11E1067			
T1	TRANSFORMER,PWR	662-0605-010		98330	R103870			
U1	REGULATOR,VOLT	351-1342-010		07263	UA78H05SC			
U2	INTEGRATED CIRCUIT REGULATOR	351-1120-100		07263	7808KC			
U3	INTEGRATED CIRCUIT REGULATOR	351-1120-140		07263	7824KC			
U4	INTEGRATED CIRCUIT REGULATOR	351-1120-130		07263	7818KC			
U5	INTEGRATED CIRCUIT REGULATOR	351-1120-120		07263	7815KC			
U6	INTEGRATED CIRCUIT REGULATOR	351-1124-030		27014	LM320K15			
XF1	FUSEHOLDER	265-1171-000		71400	HKPH			
CR1-CR10	POWER SUPPLY CARD A1	635-0903-001			635-0903-001			
CR11-	SEMICONO DEVICE	353-3718-040		14099	1N5550			
CR14	SEMICONO DEVICE	353-3644-010		03508	1N4454GE			
Q1,Q2	TRANSISTOR	352-0661-020		07263	2N2222A			
R1,R2	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/4W	745-0776-000		81349	RCR07G562KS			
R3,R4	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS			
R5,R6	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/4W	745-0776-000		81349	RCR07G562KS			
TB1	TERMINAL,BOARD	367-1599-070		71785	8-176-2			

Power Supply, Schematic Diagram
Figure 7 (Sheet 2)



635-0433
TP4-6916-014

Power Supply, Schematic Diagram
Figure 7 (Sheet 3)



635-0433
TP4-6916-014

Power Supply, Schematic Diagram
Figure 7 (Sheet 3)



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0767946-004211

4th Edition, 1 October 1980

LED Status Display
635-0825-()

LED Status Display, 635-0825-()

Printed in USA

1. DESCRIPTION

The LED Status Display 635-0825-(), shown in figure 1, consists of up to 23 transistor-switch-controlled 5-V dc LED's. LED's are lighted when +5 V dc is applied at connector pin 25, a ground is applied at connector pin 16, and a positive voltage is applied to the connector pin associated with the individual LED. Refer to table 1 and figure 2 for signals (positive to light) and their associated connector pins and LED's.

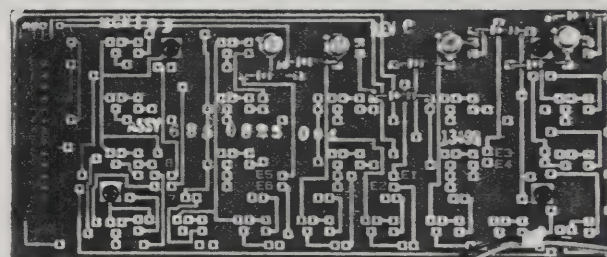
2. TESTING/TROUBLESHOOTING PROCEDURES

2.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the LED status display are listed in the maintenance section of this instruction book.

2.2 Testing

The test procedures in table 2 check total performance of the LED status display. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.



TP5-2347-017

LED Status Display
Figure 1

3. REPAIR

Repair of the LED status display is accomplished using the standard planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

523-0767946-004211

NOTICE: This section replaces third edition dated 1 June 1979.

Table 1. LED Status Display, Configuration Matrix.

LED	APPLIED SIGNAL [SILKSCREEN IF DIFFERENT]	JUMPER	INPUT PIN (A2J3)	LED STATUS DISPLAY									
				635-0825-()									
				-001	-002	-003	-004	-005	-006	-007	-008	-009	-010
DS1	Sidetone en [RF OUT]		9		X	X		X	X	X		X	
DS2	PA READY ind		10		X	X		X	X	X		X	
DS3	PA FAULT ind		11		X	X		X	X	X		X	
DS4	KEY ind		12		X	X		X	X	X		X	
DS5	R/E FAULT ind		13			X			X				
DS5	RCV FAULT ind		13	X			X				X		X
DS5	EXCTR FAULT ind		13		X			X		X		X	
DS6	RCV OVERLOAD		14	X		X	X		X		X		X
DS7	AFC LOCK ind		15										X
DS8	COUPLER FAULT ind		8		X	X		X	X	X		X	
DS9	LSB (FL2)	R9 to E2	17		X	X						X	
DS9	AM en	R9 to E1	4	X							X		X
DS10	SSB en [SSB/CW]	R10 to E3	5	X							X		X
DS10	CW en	R10 to E4	2		X	X						X	
DS11	ISB en		1		X	X						X	
DS12	USB (FL1)	R12 to E6	18		X	X						X	
DS12	ISB en	R12 to E5	1	X							X		X
DS13	AM en	R13 to E7	4		X	X						X	
DS13	FM en	R13 to E8	3										X
DS14	16 (FL8)		24	X							X		X
DS15	A (FL3)		22	X							X		X
DS16	B (FL4)		21	X							X		X
DS17	USB (FL1) [U]		18	X							X		X
DS18	LSB (FL2) [L]		17	X							X		X
DS19	C (FL5)		19	X							X		X
DS20	D (FL6)		20	X							X		X
DS21	E (FL7)		23	X							X		X
DS22	BUSY		6	X	X	X						X	X
DS23	PRESEL FAULT ind		7	X		X	X		X	X	X	X	X
				-011	-012	-013	-014						
DS1	Sidetone enbl [RF OUT]		9		X		X						
DS2	PA READY ind		10		X		X						
DS2	AM enbl		10			X							
DS3	PA FAULT ind		11		X		X						
DS3	AFC LOCK ind		11			X							
DS4	KEY ind		12		X		X						

Table 1. LED Status Display, Configuration Matrix (Cont).

LED	APPLIED SIGNAL [SILKSCREEN IF DIFFERENT]	JUMPER	INPUT PIN (A2J3)	LED STATUS DISPLAY									
				635-0825-()									
				-011	-012	-013	-014						
DS4	ISB enbl		12			X							
DS5	R/E FAULT ind		13				X						
DS5	RCV FAULT ind		13	X		X							
DS5	EXCTR FAULT ind		13		X								
DS6	RCV OVERLOAD		14	X		X	X						
DS7	AFC LOCK ind		15	X			X						
DS7	CW enbl		15			X							
DS8	COUPLER FAULT ind		8		X		X						
DS8	BUSY		8			X							
DS9	AM enbl	R9 to E1	4		X								
DS9	B1 enbl	R9 to E1	4			X							
DS10	CW enbl	R10 to E4	2		X								
DS10	B2 enbl	R10 to E3	5			X							
DS11	PEAK CLIPPER		1		X								
DS12	A1 enbl	R12 to E5	1			X							
DS13	PILOT CARRIER	R13 to E8	3		X								
DS13	A2 enbl	R13 to E8	3			X							
DS14	ISB ind		24		X								
DS14	FL1 enbl [16]		24			X							
DS15	B1 ind		22		X								
DS15	FL5 enbl [C]		22			X							
DS16	A1 ind		21		X								
DS16	FL6 enbl [D]		21			X							
DS17	FL3 enbl [A]		18			X							
DS18	B2 ind		17		X								
DS18	FL4 enbl [B]		17			X							
DS19	A2 ind		19		X								
DS19	FL7 enbl [E]		19			X							
DS20			20										
DS21			23										
DS22	NET DATA enbl		6			X							
DS23	PRESEL FAULT ind		7	X	X	X	X						

NOTES:

X indicates LED and associated circuit are installed in LED status display and any associated jumpers are installed.

A blank indicates LED and associated circuit are not installed in LED status display, and any associated jumpers are removed.

Table 2. LED Status Display, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																								
1. Setup	a. Remove top cover of unit containing LED status display to be tested. b. If local unit, remove control card A10. Install A10 extender. If control unit, remove parallel output card A12. Install A12 extender. Note Control card A10 in local unit or parallel output card A12 in control unit is not installed during these tests. c. Connect a test lead to (+5 V dc). Note This test lead is used for biasing on the switching transistors.																																										
2. LED Status Display 635-0825-001 and 635-0825-008	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead. b. Check that each LED goes out when test lead is removed from associated extender pin. c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected. <table><tr><th>d. EXTENDER PIN NO</th><th>A2J3 PIN NO</th><th>PANEL MARKING</th><th>ASSOCIATED LED</th><th>CHECK</th></tr><tr><td>74</td><td>1</td><td>ISB</td><td>DS12</td><td>DS12, Q12, R12, and R34.</td></tr><tr><td>8</td><td>4</td><td>AM</td><td>DS9</td><td>DS9, Q9, R9, R31, Q23, and R45.</td></tr><tr><td>72</td><td>5</td><td>SSB/CW</td><td>DS10</td><td>DS10, Q10, R10, and R32.</td></tr><tr><td>7</td><td>6</td><td>BUSY</td><td>*DS22</td><td>DS22, Q22, R22, and R44.</td></tr><tr><td>28</td><td>7</td><td>PRESEL FAULT</td><td>DS23</td><td>DS23, Q24, R46, and R47.</td></tr><tr><td>12</td><td>13</td><td>RCV FAULT</td><td>DS5</td><td>DS5, Q5, R5, and R27.</td></tr><tr><td>67</td><td>14</td><td>RCV OVERLOAD</td><td>DS6</td><td>DS6, Q6, R6, and R28</td></tr></table>	d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK	74	1	ISB	DS12	DS12, Q12, R12, and R34.	8	4	AM	DS9	DS9, Q9, R9, R31, Q23, and R45.	72	5	SSB/CW	DS10	DS10, Q10, R10, and R32.	7	6	BUSY	*DS22	DS22, Q22, R22, and R44.	28	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.	12	13	RCV FAULT	DS5	DS5, Q5, R5, and R27.	67	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28		
d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK																																							
74	1	ISB	DS12	DS12, Q12, R12, and R34.																																							
8	4	AM	DS9	DS9, Q9, R9, R31, Q23, and R45.																																							
72	5	SSB/CW	DS10	DS10, Q10, R10, and R32.																																							
7	6	BUSY	*DS22	DS22, Q22, R22, and R44.																																							
28	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.																																							
12	13	RCV FAULT	DS5	DS5, Q5, R5, and R27.																																							
67	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28																																							
(Cont)																																											

*Applicable only to 635-0825-001.

*Applicable only to 635-0825-001.

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	<u>EXTENDER PIN NO</u>	<u>A2J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	97	17	L	DS18	DS18, Q18, R18, and R40.
	32	18	U	DS17	DS17, Q17, R17, and R39.
	34	19	C	DS19	DS19, Q19, R18, and R41.
	35	20	D	DS20	DS20, Q20, R20, and R42.
	98	21	B	DS16	DS16, Q16, R16, and R38.
	33	22	A	DS15	DS15, Q15, R15, and R37.
	99	23	E	DS21	DS21, Q21, R21, and R43.
	100	24	16	DS14	DS14, Q14, R14, and R36.
	e. Connect +5 V dc to extender pin 72 (A2J3-5).			DS10 (SSB/CW) lights.	DS10, Q10, R10, R32, Q23, and R45.
3. LED Status Display 635-0825-002	f. Connect test lead to extender pin 74 (A2J3-1).			DS12 (ISB) lights.	DS12, Q12, R12, and R24.
				DS10 (SSB/CW) goes out.	Q23 and R45.
	g. Remove +5 V dc from extender pin 72 and test lead from extender pin 74.				
(Cont)	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead.				
	b. Check that each LED goes out when test lead is removed from associated extender pin.				
	c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected.				
	<u>EXTENDER PIN NO</u>	<u>A2J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	74	1	ISB	DS11	DS11, Q11, R11, and R33.
	9	2	CW	DS10	DS10, Q10, R10, and R32.
	8	4	AM	DS13	DS13, Q13, R13, and R35.

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	<u>EXTENDER PIN NO</u>	<u>A2J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	7	6	BUSY	DS22	DS22, Q22, R22, and R44.
	13	8	COUPLER FAULT	DS8	DS8, Q8, R8, and R30.
	5	9	RF OUT	DS1	DS1, Q1, R1, and R23.
	69	10	PA READY	DS2	DS2, Q2, R2, and R24.
	77	11	PA FAULT	DS3	DS3, Q3, R3, and R25.
	68	12	KEY	DS4	DS4, Q4, R4, and R26.
	12	13	EXCTR FAULT	DS5	DS5, Q5, R5, and R27.
	97	17	LSB	DS9	DS9, Q9, R9, Q23, and R45.
	32	18	USB	DS12	DS12, Q12, R12, and Q34.
	e. Connect +5 V dc to extender pin 9 (A2J3-2)			DS10 (CW) lights.	DS10, Q10, R10, R32, Q23, and R45.
	f. Connect test lead to extender pin 74 (A2J3-1).			DS11 (ISB) lights.	DS11, Q11, R11, and R33.
	g. Remove +5 V dc from extender pin 9 and test lead from extender pin 74.			DS10 (CW) goes out.	Q23 and R45.
4. LED Status Display 635-0825-003 (Cont)	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead.				
	b. Check that each LED goes out when test lead is removed from associated extender pin.				
	c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected.				

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. (Cont)	<u>EXTENDER PIN NO</u>	<u>A2J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	74	1	ISB	DS11	DS11, Q11, R11, and R33.
	9	2	CW	DS10	DS10, Q10, R10, and R32.
	8	4	AM	DS13	DS13, Q13, R13, and R35.
	7	6	BUSY	DS22	DS22, Q22, R22, and R44.
	28	7	PRESEL	DS23	DS23, Q24, R46, and R47.
	13	8	COUPLER FAULT	DS8	DS8, Q8, R8, and R30.
	5	9	RF OUT	DS1	DS1, Q1, R1, and R23.
	69	10	PA READY	DS2	DS2, Q2, R2, and R24.
	77	11	PA FAULT	DS3	DS3, Q3, R3, and R25.
	68	12	KEY	DS4	DS4, Q4, R4, and R26.
	12	13	R/E FAULT	DS5	DS5, Q5, R5, and R27.
	67	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28.
	97	17	LSB	DS9	DS9, Q9, R9, R31, Q23, and R45.
	32	18	USB	DS12	DS12, Q12, R12, and Q34.
	e. Connect +5 V dc to extender pin 9 (A2J3-2).			DS10 (CW) lights.	DS9, Q9, R9, R31, Q23, and R45.
	f. Connect test leads to extender pin 74 (A2J3-1).			DS11 (ISB) lights.	DS11, Q11, R11, and R33.
	g. Remove +5 V dc from extender pin 9 and test lead from extender pin 74.			DS10 (CW) goes out.	Q23 and R45.
5. LED Status Display 635-0825-004 and 635-0825-011 (Cont)	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead.				
	b. Check that each of the LED's go out when test lead is removed from associated extender pin.				

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																			
5. (Cont)	c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected. <table><tr><td>d. EXTENDER PIN NO</td><td>A2J3 PIN NO</td><td>PANEL MARKING</td><td>ASSOCIATED LED</td><td>CHECK</td></tr><tr><td>71</td><td>7</td><td>PRESEL FAULT</td><td>DS23</td><td>DS23, Q24, R46, and R47.</td></tr><tr><td>3</td><td>13</td><td>RCV FAULT</td><td>DS5</td><td>DS5, Q5, R5, and R27.</td></tr><tr><td>67</td><td>14</td><td>RCV OVERLOAD</td><td>DS6</td><td>DS6, Q6, R6, and R28.</td></tr><tr><td>2</td><td>15</td><td>AFC LOCK</td><td>*DS7</td><td>DS7, Q7, R7, and R29.</td></tr></table>	d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK	71	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.	3	13	RCV FAULT	DS5	DS5, Q5, R5, and R27.	67	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28.	2	15	AFC LOCK	*DS7	DS7, Q7, R7, and R29.												
d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK																																		
71	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.																																		
3	13	RCV FAULT	DS5	DS5, Q5, R5, and R27.																																		
67	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28.																																		
2	15	AFC LOCK	*DS7	DS7, Q7, R7, and R29.																																		
6. LED Status Display 635-0825-005	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead. b. Check that each LED goes out when test lead is removed from associated extender pin. c. Connect test lead to extender pin indicated in step d and check that the associated LED lights when test lead is connected. <table><tr><td>d. EXTENDER PIN NO</td><td>A2J3 PIN NO</td><td>PANEL MARKING</td><td>ASSOCIATED LED</td><td>CHECK</td></tr><tr><td>70</td><td>8</td><td>COUPLER FAULT</td><td>DS8</td><td>DS8, Q8, R8, and R30.</td></tr><tr><td>5</td><td>9</td><td>RF OUT</td><td>DS1</td><td>DS1, Q1, R1, and R23.</td></tr><tr><td>69</td><td>10</td><td>PA READY</td><td>DS2</td><td>DS2, Q2, R2, and R24.</td></tr><tr><td>4</td><td>11</td><td>PA FAULT</td><td>DS3</td><td>DS3, Q3, R3, and R25.</td></tr><tr><td>68</td><td>12</td><td>KEY</td><td>DS4</td><td>DS4, Q4, R4, and R26.</td></tr><tr><td>3</td><td>13</td><td>EXCTR FAULT</td><td>DS5</td><td>DS5, Q5, R5, and R27.</td></tr></table>	d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK	70	8	COUPLER FAULT	DS8	DS8, Q8, R8, and R30.	5	9	RF OUT	DS1	DS1, Q1, R1, and R23.	69	10	PA READY	DS2	DS2, Q2, R2, and R24.	4	11	PA FAULT	DS3	DS3, Q3, R3, and R25.	68	12	KEY	DS4	DS4, Q4, R4, and R26.	3	13	EXCTR FAULT	DS5	DS5, Q5, R5, and R27.		
d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK																																		
70	8	COUPLER FAULT	DS8	DS8, Q8, R8, and R30.																																		
5	9	RF OUT	DS1	DS1, Q1, R1, and R23.																																		
69	10	PA READY	DS2	DS2, Q2, R2, and R24.																																		
4	11	PA FAULT	DS3	DS3, Q3, R3, and R25.																																		
68	12	KEY	DS4	DS4, Q4, R4, and R26.																																		
3	13	EXCTR FAULT	DS5	DS5, Q5, R5, and R27.																																		
7. LED Status 635-0825-006 and 635-0825-014 (Cont)	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead. b. Check that each LED goes out when test lead is removed from extender associated extender pin. c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected.																																					

*Applicable only to 635-0825-011.

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)	d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK
	71	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.
	70	8	COUPLER FAULT	DS8	DS8, Q8, R8, and R30.
	5	9	RF OUT	DS1	DS1, Q1, R1, and R23.
	69	10	PA READY	DS2	DS2, Q2, R2, and R24.
	4	11	PA FAULT	DS3	DS3, Q3, R3, and R25.
	68	12	KEY	DS4	DS4, Q4, R4, and R26.
	3	13	R/E FAULT	DS5	DS5, Q5, R5, and R27.
	67	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28.
	2	15	AFC LOCK	*DS7	DS7, Q7, R7, and R29.
8. LED Status Display 635-0825-007	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead.				
	b. Check that each LED goes out when test lead is removed from associated extender pin.				
	c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected.				
	d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK
	71	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.
	70	8	COUPLER FAULT	DS8	DS8, Q8, R8, and R30.
	5	9	RF OUT	DS1	DS1, Q1, R1, and R23.
	69	10	PA READY	DS2	DS2, Q2, R2, and R24.
	4	11	PA FAULT	DS3	DS3, Q3, R3, and R25.
	68	12	KEY	DS4	DS4, Q4, R4, and R26.
	3	13	EXCTR FAULT	DS5	DS5, Q5, R5, and R27.
*Applicable only to 635-0825-014.					

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. LED Status Display 635-0825-009	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead.				
	b. Check that each LED goes out when test lead is removed from associated extender pin.				
	c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected.				
	d. EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK
	74	1	ISB	DS11	DS11, Q11, R11, and R33.
	9	2	CW	DS10	DS10, Q10, R10, and R32.
	8	4	AM	DS13	DS13, Q13, R13, and R35.
	7	6	BUSY	DS22	DS22, Q22, R22, and R44.
	71	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.
	70	8	COUPLER FAULT	DS8	DS8, Q8, R8, and R30.
	5	9	RF OUT	DS1	DS1, Q1, R1, and R23.
	69	10	PA READY	DS2	DS2, Q2, R2, and R24.
	4	11	PA FAULT	DS3	DS3, Q3, R3, and R25.
	68	12	KEY	DS4	DS4, Q4, R4, and R26.
	3	13	EXCTR FAULT	DS5	DS5, Q5, R5, and R27.
(Cont)	97	17	LSB	DS9	DS9, Q9, R9, Q23, and R45.
	32	18	USB	DS12	DS12, Q12, R12, and Q34.

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																	
9. (Cont)	e. Connect +5 V dc to extender pin 9 (A2J3-2). f. Connect test lead to extender pin 74 (A2J3-1). g. Remove +5 V dc from extender pin 9 and test lead from extender pin 74.	DS10 (CW) lights. DS11 (ISB) lights. DS10 (CW) goes out.	DS10, Q10, R10, R32, Q23, and R45. DS11, Q11, R11, and R33. Q23 and R45.																																																																	
10. LED Status Display 635-0825-010	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead. b. Check that each LED goes out when test lead is removed from associated extender pin. c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected. <table><tr><th>EXTENDER PIN NO</th><th>A2J3 PIN NO</th><th>PANEL MARKING</th><th>ASSOCIATED LED</th><th>CHECK</th></tr><tr><td>74</td><td>1</td><td>ISB</td><td>DS12</td><td>DS12, Q12, R12, and R34.</td></tr><tr><td>73</td><td>3</td><td>FM</td><td>DS13</td><td>DS13, Q13, R13, and R35.</td></tr><tr><td>8</td><td>4</td><td>AM</td><td>DS9</td><td>DS9, Q9, R9, R31, Q23, and R45.</td></tr><tr><td>72</td><td>5</td><td>SSB/CW</td><td>DS10</td><td>DS10, Q10, R10, and R32.</td></tr><tr><td>7</td><td>6</td><td>BUSY</td><td>DS22</td><td>DS22, Q22, R22, and R44.</td></tr><tr><td>28</td><td>7</td><td>PRESEL FAULT</td><td>DS23</td><td>DS23, Q24, R46, and R47.</td></tr><tr><td>12</td><td>13</td><td>RCV FAULT</td><td>DS5</td><td>DS5, Q5, R5, and R27.</td></tr><tr><td>67</td><td>14</td><td>RCV OVERLOAD</td><td>DS6</td><td>DS6, Q6, R6, and R28.</td></tr><tr><td>2</td><td>15</td><td>AFC LOCK</td><td>DS7</td><td>DS7, Q7, R7, and R29.</td></tr><tr><td>97</td><td>17</td><td>L</td><td>DS18</td><td>DS18, Q18, R18, and R40.</td></tr><tr><td>32</td><td>18</td><td>U</td><td>DS17</td><td>DS17, Q17, R17, and R39.</td></tr><tr><td>34</td><td>19</td><td>C</td><td>DS19</td><td>DS19, Q19, R18, and R41.</td></tr></table>	EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK	74	1	ISB	DS12	DS12, Q12, R12, and R34.	73	3	FM	DS13	DS13, Q13, R13, and R35.	8	4	AM	DS9	DS9, Q9, R9, R31, Q23, and R45.	72	5	SSB/CW	DS10	DS10, Q10, R10, and R32.	7	6	BUSY	DS22	DS22, Q22, R22, and R44.	28	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.	12	13	RCV FAULT	DS5	DS5, Q5, R5, and R27.	67	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28.	2	15	AFC LOCK	DS7	DS7, Q7, R7, and R29.	97	17	L	DS18	DS18, Q18, R18, and R40.	32	18	U	DS17	DS17, Q17, R17, and R39.	34	19	C	DS19	DS19, Q19, R18, and R41.		
EXTENDER PIN NO	A2J3 PIN NO	PANEL MARKING	ASSOCIATED LED	CHECK																																																																
74	1	ISB	DS12	DS12, Q12, R12, and R34.																																																																
73	3	FM	DS13	DS13, Q13, R13, and R35.																																																																
8	4	AM	DS9	DS9, Q9, R9, R31, Q23, and R45.																																																																
72	5	SSB/CW	DS10	DS10, Q10, R10, and R32.																																																																
7	6	BUSY	DS22	DS22, Q22, R22, and R44.																																																																
28	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.																																																																
12	13	RCV FAULT	DS5	DS5, Q5, R5, and R27.																																																																
67	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28.																																																																
2	15	AFC LOCK	DS7	DS7, Q7, R7, and R29.																																																																
97	17	L	DS18	DS18, Q18, R18, and R40.																																																																
32	18	U	DS17	DS17, Q17, R17, and R39.																																																																
34	19	C	DS19	DS19, Q19, R18, and R41.																																																																
(Cont)																																																																				

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
10. (Cont)	<u>EXTENDER PIN NO</u>	<u>A2J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	35	20	D	DS20	DS20, Q20, R20, and R42.
	98	21	B	DS16	DS16, Q16, R16, and R38.
	33	22	A	DS15	DS15, Q15, R15, and R37.
	99	23	E	DS21	DS21, Q21, R21, and R43.
	100	24	16	DS14	DS14, Q14, R14, and R36.
	e. Connect +5 V dc to extender pin 72 (A2J3-5).			DS10 (SSB/CW) lights.	DS10, Q10, R10, R32, Q23, and R45.
	f. Connect test lead to extender pin 74 (A2J3-1).			DS12 (ISB) lights.	DS12, Q12, R12, and R24.
				DS10 (SSB/CW) goes out.	Q23 and R45.
	g. Remove +5 V dc from extender pin 72 and test lead from extender pin 74.				
11. LED Status Display 635-0825-012	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead.				
	b. Check that each LED goes out when test lead is removed from associated extender pin.				
	c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected.				
	<u>EXTENDER PIN NO</u>	<u>A3J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	74	1	PEAK CLIPPER	DS11	DS11, Q11, R11, and R33.
	9	2	CW	DS10	DS10, Q10, R10, and R32.
	73	3	PILOT CARRIER	DS13	DS13, Q13, R13, and R35.
	8	4	AM	DS9	DS9, Q9, R9, and R31.
	71	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.
	70	8	COUPLER FAULT	DS8	DS8, Q8, R8, and R30.
(Cont)					

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
11. (Cont)	<u>EXTENDER PIN NO</u>	<u>A2J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	5	9	RF OUT	DS1	DS1, Q1, R1, and R23.
	69	10	PA READY	DS2	DS2, Q2, R2, and R24.
	4	11	PA FAULT	DS3	DS3, Q3, R3, and R25.
	68	12	KEY	DS4	DS4, Q4, R4, and R26.
	3	13	EXCTR FAULT	DS5	DS5, Q5, R5, and R27.
	NA (A2J2-24)	17	B2	DS18	DS18, Q18, R18, and R40.
	NA (A2J2-22)	19	A2	DS19	DS19, Q19, R19, and R41.
	NA (A2J2-20)	21	A1	DS16	DS16, Q16, R16, and R38.
	NA (A2J2-19)	22	B1	DS15	DS15, Q15, R15, and R37.
	NA (J9-9)	24	ISB	DS14	DS14, Q14, R14, and R36.
12. LED Status Display 635-0825-013	a. Check that none of the LED's listed in step d are lighted before associated extender pin is connected to test lead.				
	b. Check that each LED goes out when test lead is removed from associated extender pin.				
	c. Connect test lead to extender pin indicated in step d and check that associated LED lights when test lead is connected.				
	<u>EXTENDER PIN NO</u>	<u>A2J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	26	1	A1	DS12	DS12, Q12, R12, and R34.
	17	3	A2	DS13	DS13, Q13, R13, and R35.
	6	4	B1	DS9	DS9, Q9, R9, R31, Q23, and R45.
	74	5	B2	DS10	DS10, Q10, R10, and R32.
	73	6	NET DATA	DS22	DS22, Q22, R22, and R44.
(Cont)					

Table 2. LED Status Display, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
12. (Cont)	<u>EXTENDER PIN NO</u>	<u>A2J3 PIN NO</u>	<u>PANEL MARKING</u>	<u>ASSOCIATED LED</u>	<u>CHECK</u>
	71	7	PRESEL FAULT	DS23	DS23, Q24, R46, and R47.
	NA (J14-10)	9	FM	DS1	DS, Q1, R1, and R23.
	8	10	AM	DS2	DS2, Q2, R2, and R24.
	66	11	AFC LOCK	DS3	DS3, Q3, R3, and R25.
	9	12	ISB	DS4	DS4, Q4, R4, and R26.
	13	13	RCV FAULT	DS5	DS5, Q5, R5, and R27.
	68	14	RCV OVERLOAD	DS6	DS6, Q6, R6, and R28.
	72	15	CW	DS7	DS7, Q7, R7, and R29.
	NA (J9-37)	17	FLB	DS18	DS18, Q18, R18, and R40.
	NA (J9-100)	18	FLA	DS17	DS17, Q17, R17, and R39.
	NA (J9-12)	19	FLE	DS19	DS19, Q19, R18, and R41.
	NA (J9-41)	21	FLD	DS16	DS16, Q16, R16, and R38.
	NA (J9-106)	22	FLC	DS15	DS15, Q15, R15, and R37.
	NA (J9-99)	24	16 kHz	DS14	DS14, Q14, R14, and R36.

4. PARTS LIST/DIAGRAMS

4.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and also in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 2). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

4.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the **DESCRIPTION** column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV)

stamped on the circuit card/subassembly and is listed in the **EFFECTIVITY** column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

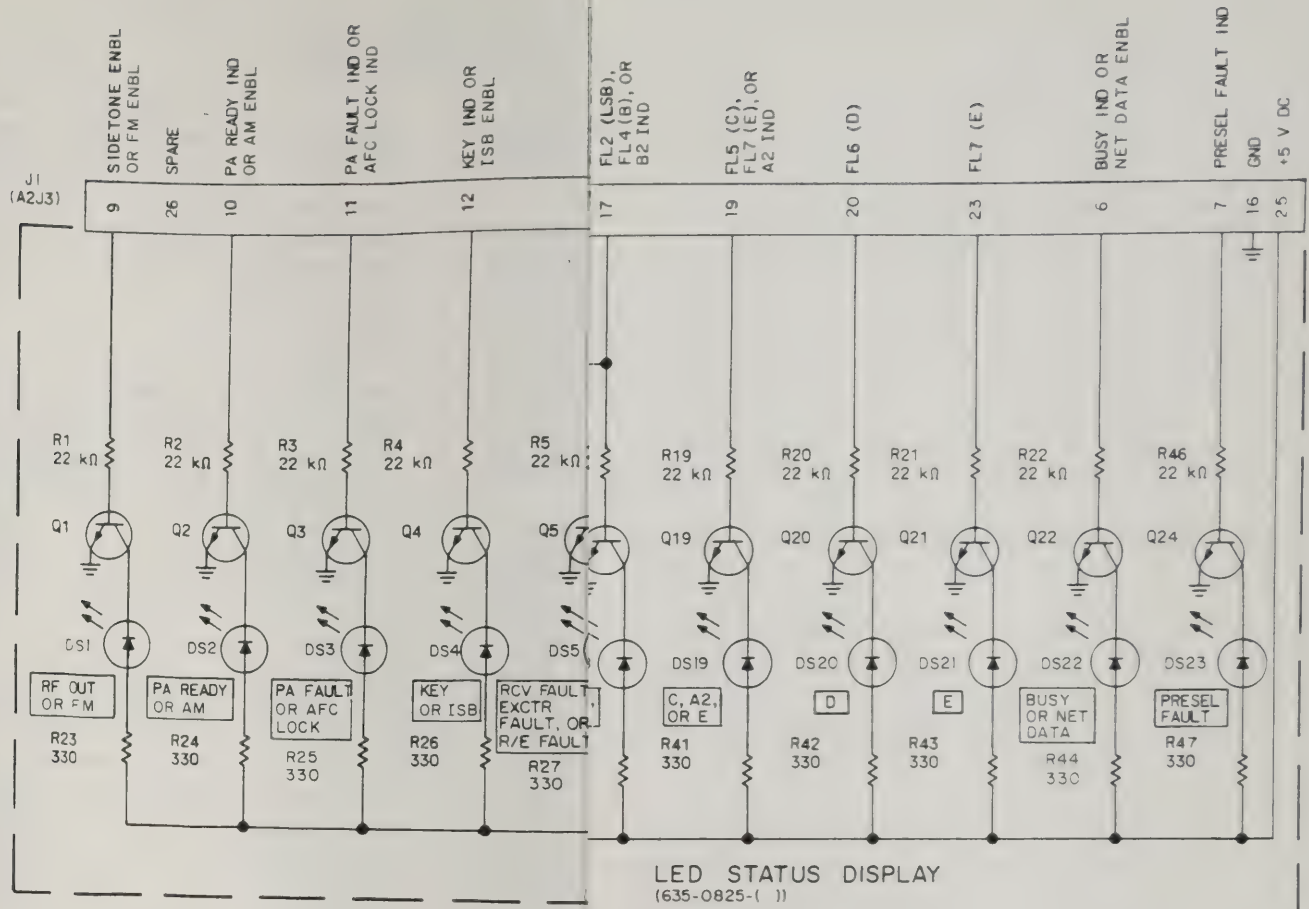
Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

CODE	MANUFACTURER'S NAME AND ADDRESS
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
04404	HEWLETT-PACKARD CO AUTOMATIC MEASUREMENT DIV 974 E ARQUES AVE SUNNYVALE CA 94086
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
81349	MILITARY SPECIFICATION

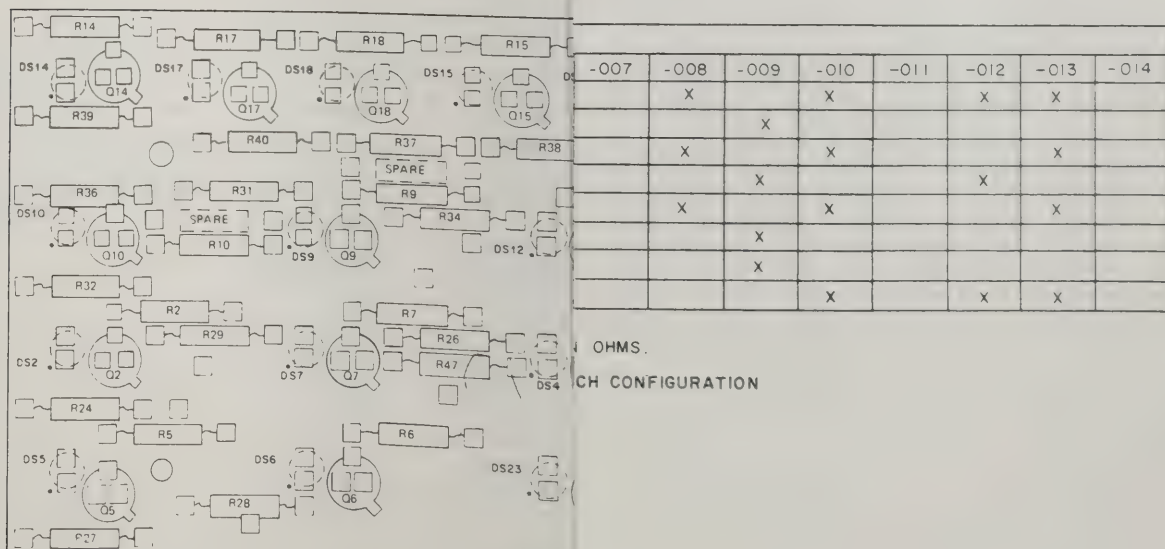
4.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
LED status display	635-0825-001	REV C
LED status display	635-0825-002	REV E
LED status display	635-0825-003	REV E
LED status display	635-0825-004	REV D
LED status display	635-0825-005	REV D
LED status display	635-0825-006	REV D
LED status display	635-0825-007	REV G
LED status display	635-0825-008	REV J
LED status display	635-0825-009	REV J
LED status display	635-0825-010	REV —
LED status display	635-0825-011	REV P
LED status display	635-0825-012	REV P
LED status display	635-0825-013	REV N
LED status display	635-0825-014	REV —



LED.
(YELLOW) LED.



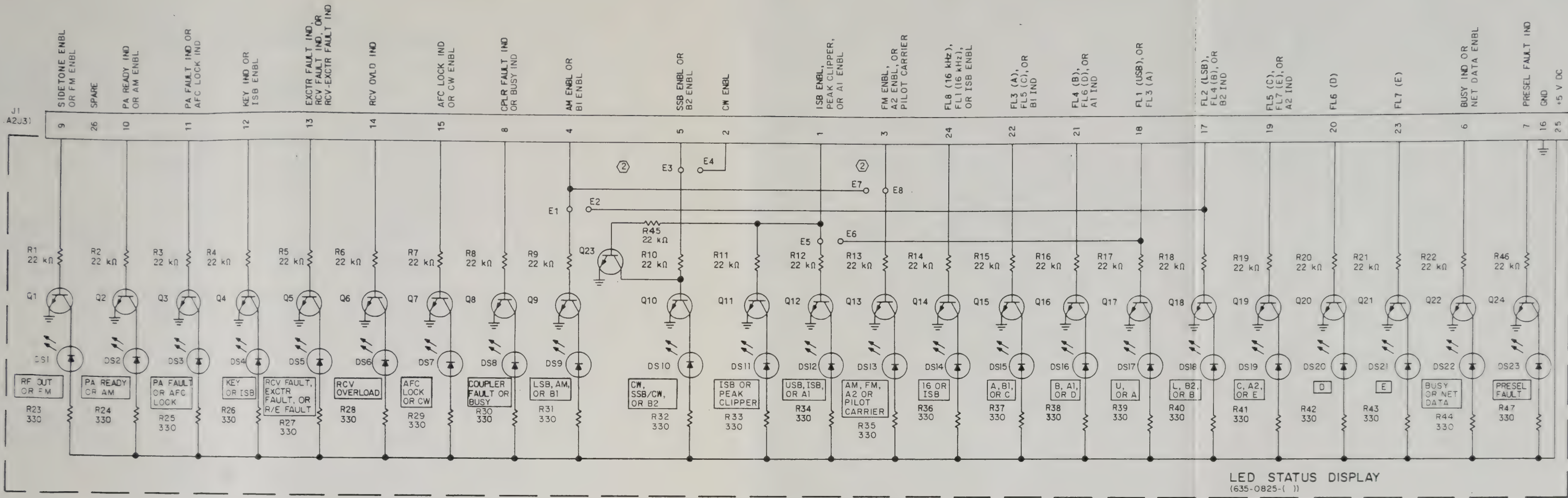
OHMS.

CH CONFIGURATION

TPA-2371-014

NOTE: ALL LEDES ARE MOUNTED ON BOTTOM OF BOARD

LED Status Display, Schematic Diagram
Figure 2 (Sheet 1 of 3)



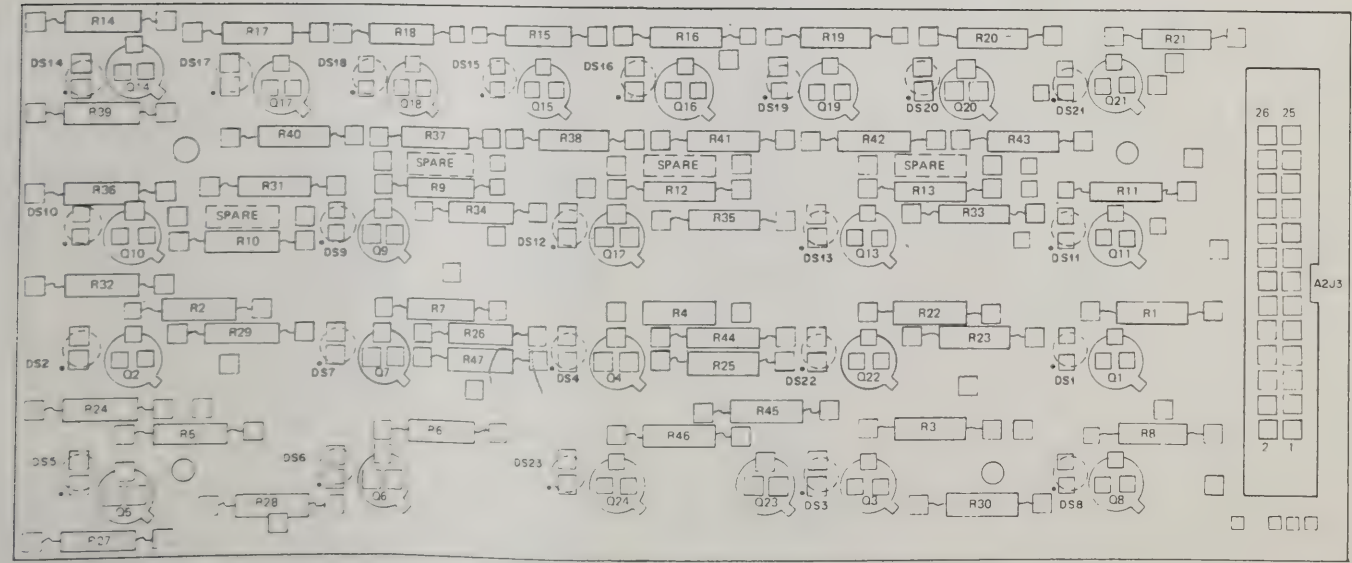
NOTES:

- ① Q1-Q24 ARE TYPE 2N2222A.
DS3, DS5, DS6, DS8, AND DS23 ARE TYPE HP5082-4684 (RED) LED.
DS1, DS2, DS4, DS7, AND DS9-DS22 ARE TYPE HP5082-4584 (YELLOW) LED.

- ② E1 THRU E8 CONNECTED AS FOLLOWS:

JUMPER	635-0825-1												
	-001	-002	-003	-004	-005	-006	-007	-008	-009	-010	-011	-012	-013
R9 TO E1	X							X		X		X	X
R9 TO E2		X	X						X				
R10 TO E3	X							X		X			X
R10 TO E4		X	X						X			X	
R12 TO E5	X							X		X			X
R12 TO E6		X	X						X				
R13 TO E7		X	X						X				
R13 TO E8										X		X	X

- ③ UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS.
④ REFER TO PARTS LIST FOR ACTUAL CIRCUITS USED IN EACH CONFIGURATION OF THE LED STATUS DISPLAY.



NOTE: ALL LEDES ARE MOUNTED ON BOTTOM OF BOARD

TP5-1156-013

TPA-2371-014

LED Status Display, Schematic Diagram
Figure 2 (Sheet 1 of 3)

PARTS LIST

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION
DS1-DS4	LED STATUS DISPLAY	635-0825-001		7-000		81349	RCR07G223KS	Q5-Q7	TRANSISTOR
DS5,DS6	DIODE, LIGHT EMI	353-0232-030		04404	7-000	81349	RCR07G331KS	Q8	NOT USED
DS7,DS8	NOT USED							Q9,Q10	TRANSISTOR
DS9,DS10	DIODE, LIGHT EMI	353-0232-010		04404	7-008			Q11	NOT USED
DS11	NOT USED							Q12	TRANSISTOR
DS12	DIODE, LIGHT EMI	353-0232-010		04404	7-030	04404	HLMP1301	Q13	NOT USED
DS13	NOT USED							Q14-Q24	TRANSISTOR
DS14-	DIODE, LIGHT EMI	353-0232-010		04404	7-010	04404	HLMP1401	R1-R4	NOT USED
DS22								P5-R7	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
DS23	DIODE, LIGHT EMI	353-0232-030		04404	7-010	04404	HLMP1401	R8	NOT USED
J1	HOUSING,CONN,EL	372-0043-410		00779				R9,R10	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
Q1-Q4	NOT USED							R11	NOT USED
Q5,Q6	TRANSISTOR	352-0661-020		07263	7-010	04404	HLMP1401	R12	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
Q7,Q8	NOT USED							R13	NOT USED
Q9,Q10	TRANSISTOR	352-0661-020		07263	7-030	04404	HLMP1301	R14-R22	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
Q11	NOT USED					00779	87478-4	R23-R26	NOT USED
Q12	TRANSISTOR	352-0661-020		07263	7-410			R27-R29	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
Q13	NOT USED							R30	NOT USED
Q14-Q24	TRANSISTOR	352-0661-020		07263	7-020	07263	2N2222A	R31,R32	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
R1-R4	NOT USED							R33	NOT USED
R5,R6	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-020	07263	2N2222A	R34	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
R7,R8	NOT USED							R35	NOT USED
R9,R10	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-020	07263	2N2222A	R36-R44	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
R11	NOT USED							R45,R46	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
R12	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-020	07263	2N2222A	R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
R13	NOT USED								
R14-R22	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-020	07263	2N2222A		
R23-R26	NOT USED								
R27,R28	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	7-000	81349	RCR07G223KS	DS1-DS4	LED STATUS DISPLAY
R29,R30	NOT USED							DS5,DS6	DIODE, LIGHT EMI
R31,R32	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	7-000	81349	RCR07G223KS	DS7	DIODE, LIGHT EMI
R33	NOT USED							DS8-DS22	NOT USED
R34	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	7-000	81349	RCR07G223KS	DS23	DIODE, LIGHT EMI
R35	NOT USED							J1	HOUSING,CONN,EL
R36-R44	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	7-000	81349	RCR07G223KS	Q1-Q4	NOT USED
R45,R46	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-000	81349	RCR07G223KS	Q5-Q7	TRANSISTOR
R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	7-000	81349	RCR07G331KS	Q8-Q23	NOT USED
								Q24	TRANSISTOR
								R1-R4	NOT USED
								R5-R7	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
								R8-R26	NOT USED
								R27-R29	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
								R30-R44	NOT USED
								R45,R46	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
								R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
DS1,DS2	LED STATUS DISPLAY	635-0825-002							
DS3	DIODE, LIGHT EMI	353-0232-010		04404	7-000	81349	RCR07G331KS	DS1,DS2	LED STATUS DISPLAY
DS4	DIODE, LIGHT EMI	353-0232-030		04404	7-000	81349	RCR07G331KS	DS3	DIODE, LIGHT EMI
DS5	DIODE, LIGHT EMI	353-0232-010		04404	7-000	81349	RCR07G331KS	DS4	DIODE, LIGHT EMI
DS6,DS7	NOT USED							DS5	DIODE, LIGHT EMI
DS8	DIODE, LIGHT EMI	353-0232-030		04404	7-000	81349	RCR07G223KS	DS6,DS7	NOT USED
DS9-DS13	DIODE, LIGHT EMI	353-0232-010		04404	7-000	81349	RCR07G331KS	DS8	DIODE, LIGHT EMI
DS14-	NOT USED							DS9-DS11	DIODE, LIGHT EMI
DS21								DS12	NOT USED
DS22	DIODE, LIGHT EMI	353-0232-010		04404	7-010	04404	HLMP1401	DS13-	DIODE, LIGHT EMI
J1	HOUSING,CONN,EL	372-0043-410		00779	7-030	04404	HLMP1301	DS16	
Q1-Q5	TRANSISTOR	352-0661-020		07263	7-010	04404	HLMP1401	DS17	NOT USED
Q6,Q7	NOT USED							DS18,	DIODE, LIGHT EMI
Q8-Q13	TRANSISTOR	352-0661-020		07263	7-030	04404	HLMP1401	DS19	
Q14-Q21	NOT USED							DS20-	NOT USED
Q22,Q23	TRANSISTOR	352-0661-020		07263	7-410	00779	87478-4	DS22	
R1-R5	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-020	07263	2N2222A	DS23	DIODE, LIGHT EMI
R6,R7	NOT USED							J1	HOUSING,CONN,EL
R8-R13	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-020	07263	2N2222A	Q1-Q5	TRANSISTOR
R14-R21	NOT USED							Q6,Q7	NOT USED
R22	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-030	07263	2N2222A	Q8-Q11	TRANSISTOR
R23-R27	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	7-410	81349	RCR07G223KS	Q12	NOT USED
R28,R29	NOT USED							Q13-Q16	TRANSISTOR
R30-R35	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	7-020	81349	RCR07G223KS	Q17	NOT USED
R36-R43	NOT USED							Q18,Q19	TRANSISTOR
R44	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	7-020	81349	RCR07G223KS	Q20-Q23	NOT USED
R45	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	7-000	81349	RCR07G331KS	Q24	TRANSISTOR
								R1-R5	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
								R6,R7	NOT USED
								R8-R11	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
								R12	NOT USED
								R13-R16	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
								R17	NOT USED
								R18,R19	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
								R20-R22	NOT USED
								R23-R27	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
								R28,R29	NOT USED
								R30-R33	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
								R34	NOT USED
								R35-R38	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
								R39	NOT USED
								R40,R41	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W
								R42-R45	NOT USED
								R46	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W
								R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W

LED Status

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R33	NOT USED				
R35	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R43	NOT USED				
R44	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R45,R46	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-004			
DS4	NOT USED				
DS6	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS7-DS22	NOT USED				
DS23	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
J1	HOUSING,CONN,EL	372-0043-410		00779	87478-4
Q4	NOT USED				
Q6	TRANSISTOR	352-0661-020		07263	2N2222A
Q23	NOT USED				
Q24	TRANSISTOR	352-0661-020		07263	2N2222A
R1-R4	NOT USED				
R5,R6	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R7-R26	NOT USED				
R27,R28	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R-R45	NOT USED				
R	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R7	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-005			
DS1,DS2	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS3	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS4	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS5	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS6,DS7	NOT USED				
DS8	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
J1	HOUSING,CONN,EL	372-0043-410		00779	87478-4
Q5	TRANSISTOR	352-0661-020		07263	2N2222A
Q7	NOT USED				
Q24	TRANSISTOR	352-0661-020		07263	2N2222A
R5	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R6,R7	NOT USED				
R8	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R22	NOT USED				
R27	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R29	NOT USED				
R	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-006			
DS1,DS2	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS3	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS4	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS5,DS6	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS7	NOT USED				
DS8	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS9-DS22	NOT USED				
DS23	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
J1	HOUSING,CONN,EL	372-0043-410		00779	87478-4
Q6	TRANSISTOR	352-0661-020		07263	2N2222A
Q8	NOT USED				
Q9-Q23	NOT USED				
Q24	TRANSISTOR	352-0661-020		07263	2N2222A
R6	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
	NOT USED				
R22	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R23-R28	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R29	NOT USED				
R30	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R-R45	NOT USED				
R	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R7	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-007			
DS1,DS2	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS3	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS4	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS5	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS6,DS7	NOT USED				
DS8	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS9-DS22	NOT USED				
DS23	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
J1	HOUSING,CONN,EL	372-0043-410		00779	87478-4
Q5	TRANSISTOR	352-0661-020		07263	2N2222A
Q7	NOT USED				
Q23	TRANSISTOR	352-0661-020		07263	2N2222A
Q24	TRANSISTOR	352-0661-020		07263	2N2222A
R5	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R7	NOT USED				
R	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R22	NOT USED				
R23-R27	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R28,R29	NOT USED				
R30	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R31-R45	NOT USED				
R46	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-008			
DS1-DS4	NOT USED				
DS5,DS6	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS7,DS8	NOT USED				
DS9,DS10	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS11	NOT USED				
DS12	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS13	NOT USED				
DS14-	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS21	NOT USED				
DS22	NOT USED				
DS23	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
J1	HOUSING,CONN,EL	372-0043-410		00779	87478-4
Q1-Q4	NOT USED				
Q5,Q6	TRANSISTOR	352-0661-020		07263	2N2222A
Q7,Q8	NOT USED				
Q9,Q10	TRANSISTOR	352-0661-020		07263	2N2222A
Q11	NOT USED				
Q12	TRANSISTOR	352-0661-020		07263	2N2222A
Q13	NOT USED				
Q14-Q21	TRANSISTOR	352-0661-020		07263	2N2222A
Q22	NOT USED				
Q23,Q24	TRANSISTOR	352-0661-020		07263	2N2222A
R1-R4	NOT USED				
R5,R6	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R7,R8	NOT USED				
R9,R10	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R11	NOT USED				
R12	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R13	NOT USED				
R14-R21	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R22-R26	NOT USED				
R27,R28	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R29,R30	NOT USED				
R31,R32	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R33	NOT USED				
R34	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R35	NOT USED				
R36-R43	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R44	NOT USED				
R45,R46	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-009			
DS1-DS2	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS3	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS4	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS5	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS6,DS7	NOT USED				
DS8	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS9-DS13	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS14-	NOT USED				
DS21	NOT USED				
DS22	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS23	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
J1	HOUSING,CONN,EL	372-0043-410		00779	87478-4
Q1-Q5	TRANSISTOR	352-0661-020		07263	2N2222A
Q6,Q7	NOT USED				
Q8-Q13	TRANSISTOR	352-0661-020		07263	2N2222A
Q14-Q21	NOT USED				
Q22-Q24	TRANSISTOR	352-0661-020		07263	2N2222A
R1-R5	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R6,R7	NOT USED				
R8-R13	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R14-R21	NOT USED				
R22	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R23-R27	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R28,R29	NOT USED				
R30-R35	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R44	NOT USED				
R45,R46	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-010			
DS1-DS4	NOT USED				
DS5,DS6	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS7	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS8	NOT USED				
DS9,DS10	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS11	NOT USED				
DS12	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS13	NOT USED				
DS14-	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS22	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
J1	HOUSING,CONN,EL	372-0043-410		00779	87478-4
Q1-Q4	NOT USED				

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
Q5-Q7	TRANSISTOR	352-0661-020			07263 2N2222A
Q8	NOT USED				
Q9,Q10	TRANSISTOR	352-0661-020			07263 2N2222A
Q11	NOT USED				
Q12	TRANSISTOR	352-0661-020			07263 2N2222A
Q13	NOT USED				
Q14-Q24	TRANSISTOR	352-0661-020			07263 2N2222A
R1-R4	NOT USED				
R5-R7	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R8	NOT USED				
R9,R10	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R11	NOT USED				
R12	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R13	NOT USED				
R14-R22	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R23-R26	NOT USED				
R27-R29	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R30	NOT USED				
R31,R32	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R33	NOT USED				
R34	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R35	NOT USED				
R36-R44	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R45,R46	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R47	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-011			
DS1-DS4	NOT USED				
DS5,DS6	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	LED STATUS DISPLAY	635-0825-013			
DS1	NOT USED	353-0232-010		04404	HLMP1401
DS2	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS3	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS4	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS5, DS6	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS7-DS10	DIODE, LIGHT EMI				
DS11	NOT USED	353-0232-010		04404	HLMP1401
DS12-	DIODE, LIGHT EMI				
DS19					
DS20,	NOT USED				
DS21		353-0232-010		04404	HLMP1401
DS22	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS23	DIODE, LIGHT EMI	372-0043-410		00779	87478-4
J1	HOUSING, CONN, EL				
Q1	NOT USED				
Q2-Q10	TRANSISTOR	352-0661-020		07263	2N2222A
Q11	NOT USED				
Q12-Q19	TRANSISTOR	352-0661-020		07263	2N2222A
Q20, Q21	NOT USED				
Q22	TRANSISTOR	352-0661-020		07263	2N2222A
Q23	NOT USED				
Q24	TRANSISTOR	352-0661-020		07263	2N2222A
R1	NOT USED				
R2-R10	RESISTOR, FXD CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R11	NOT USED				
R12-R19	RESISTOR, FXD CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R20, R21	NOT USED				
R22	RESISTOR, FXD CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R23	NOT USED				
R24-R32	RESISTOR, FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R33	NOT USED				
R34-R41	RESISTOR, FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R42, R43	NOT USED				
R44	RESISTOR, FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R45	NOT USED				
R46	RESISTOR, FXD CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R47	RESISTOR, FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
	LED STATUS DISPLAY	635-0825-014			
DS1, DS2	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS3	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS4	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS5, DS6	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS7	DIODE, LIGHT EMI	353-0232-010		04404	HLMP1401
DS8	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
DS9-DS22	NOT USED				
DS23	DIODE, LIGHT EMI	353-0232-030		04404	HLMP1301
J1	HOUSING, CONN, EL	372-0043-410		00779	87478-4
Q1-Q8	TRANSISTOR	352-0661-020		07263	2N2222A
Q9-Q23	NOT USED				
Q24	TRANSISTOR	352-0661-020		07263	2N2222A
R1-R8	RESISTOR, FXD CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R9-R22	NOT USED				
R23-R30	RESISTOR, FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R31-R45	NOT USED				
R46	RESISTOR, FXD CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R47	RESISTOR, FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS

LED Status Display, Schematic Diagram
Figure 2 (Sheet 3)



Rockwell
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instructions

Frequency Switchboard (635-0830-001, -002)

Collins Telecommunications Products Division

Printed in USA

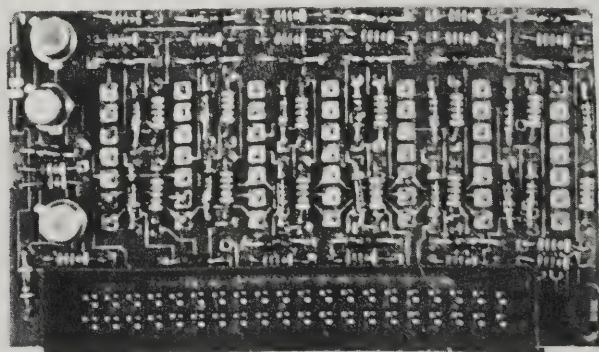
523-076947-003211
3rd Edition, 1 October 1980

Frequency Switchboard
(635-0830-001, -002)

1. DESCRIPTION

Frequency Switchboard 635-0830-001, -002, shown in figure 1, consists of a 7/8-section thumb-wheel frequency selector switch, a local frequency enable circuit, and logic pullup for logic outputs.

The thumb-wheel frequency selector switches are set for the appropriate digits of the desired frequency, and a parallel bcd frequency control output is supplied from the frequency switchboard. Refer to table 1 and figure 2 for a logic truth table and the pins associated with the bcd outputs.



TP5-2346-017

Frequency Switchboard
Figure 1

Table 1. Frequency Switchboard, Logic Truth Table.

THUMB WHEEL (kHz)	A2J4 PIN NO			
10.000	37	38	NA	NA
1,000	33	34	35	36
100	29	30	31	32
10	25	26	27	28
1	21	22	23	24
.1	17	18	19	20
* .01	13	14	15	16
FREQUENCY DIGIT	BCD OUTPUT			
	1	2	4	8
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

*Not used on 635-0830-001

2. TESTING/TROUBLESHOOTING PROCEDURES

2.1 Test Equipment and Power Requirements

Test equipment and power sources required to voltage test, troubleshoot, and repair the frequency

NOTICE: This section replaces second edition dated 1 June 1978.

523-076947-003211

switchboard are listed in the maintenance section of this instruction book.

2.2 Testing

The test procedures in table 2 check total performance of the frequency switchboard. These test procedures permit isolation of a fault to a specific

component or circuit when the results are used with the schematic to circuit trace the fault.

3. REPAIR

Repair of the frequency switchboard is accomplished using the standard planar card repair procedures.

Table 2. Frequency Switchboard, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit containing frequency switchboard to be tested. Note Testing procedures (test 2) on frequency switchboard used in the controls (HF-8090/8091/8092) can be accomplished with the top cover in place. b. If local unit, remove control card A10. Install A10 extender. If control unit, remove parallel input card A11. Install A11 extender. Note Control card A10 in local unit or parallel input card A11 in control unit are not installed during tests 3 through 5. c. Apply power to unit.		
2. Testing procedures when installed in control	a. Set CONT switch to TEST. b. Rotate frequency switches through their complete range.	Note that frequency display readout agrees with frequency switch setting.	Proceed to test 3.
3. Testing and troubleshooting procedures	a. Set CONT switch to LCL or NORM. b. Connect dvm to first extender pin shown in chart. c. Rotate associated thumb wheel through its range.	Refer to chart.	If no logic 1 indications, check Q3 and CR2. If no logic 0 indications, check Q1, Q2, and associated components.

Table 2. Frequency Switchboard, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)			If other malfunctions exist, check components associated with A2J4 pin number of thumb wheel in question.
(Cont)	d. Repeat steps b and c for each extender pin shown in chart.		

THUMB WHEEL (kHz)	BCD OUTPUT	EXTENDER PIN NO	A2J4 PIN NO	THUMB-WHEEL POSITION									
				0	1	2	3	4	5	6	7	8	9
10 000	2 1	129 64	38 37	0 0	0 1	1 0		Not applicable					
1000	8 4 2 1	128 63 127 62	36 35 34 33	0 0 0 0	0 0 0 1	0 0 1 1	0 0 1 0	0 1 0 1	0 1 0 0	0 1 1 0	0 1 0 1	1 0 0 0	1 0 0 1
100	8 4 2 1	126 61 125 60	32 31 30 29	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 0	1 0 0 0	1 0 0 1
10	8 4 2 1	124 59 123 58	28 27 26 25	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 0	1 0 0 0	1 0 0 1
1	8 4 2 1	122 57 121 56	24 23 22 21	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 0	1 0 0 0	1 0 0 1
0.1	8 4 2 1	120 55 119 54	19 18 17 16	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 0	1 0 0 0	1 0 0 1
*0.01	8 4 2 1	118 53 117 52	15 14 13 12	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 0	1 0 0 0	0 0 0 1

Logic 1 = NLT +3.0 V dc.
Logic 0 NMT 0.5 V dc.
*Applicable only to 635-0830-002.

Table 2. Frequency Switchboard, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. Frequency change signal	a. Set CONT switch to LCL or NORM. b. Connect dvm to extender pin 47 (local unit A10 extender) or extender pin 13 (control unit A11 extender). c. Slowly rotate each frequency switch through its complete range. Note Steps d and e are applicable only to frequency switchboards installed in local units. d. Set CONT switch to REM (not applicable to controls). e. Rotate all frequency switches through their complete range.	Note a logic 1 spike between each frequency switch position. Note that there is no logic 1 spike between each frequency switch position. Note the voltage at the associated A2J4 pins for each frequency setting of each switch. 0 V on all pins.	Replace associated switch thumb wheel. Unit malfunction. Unit malfunction.

Refer to the maintenance section of this instruction book for planar card repair procedures.

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.

4. PARTS LIST/DIAGRAMS

4.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 2). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference

designator. In addition, the manufacturer's code and part number are listed when applicable.

4.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applied to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
00779	AMP, Inc. P.O. Box 3608 Harrisburg, PA 17105
03508	General Electric Co. Semi-Conductor Products Dept. W. Genesee St. Auburn, NY 13021

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
04713	Motorola, Inc. Semiconductor Products Group 5005 E. McDowell Rd. Phoenix, AZ 85008
07126	Digitran Co., The 855 South Arroyo Parkway Pasadena, CA 91105
07263	Fairchild Camera and Instrument Corp. Semiconductor Div. 464 Ellis St. Mountain View, CA 94042
81349	Military Specifications

4.3 Equipment Covered

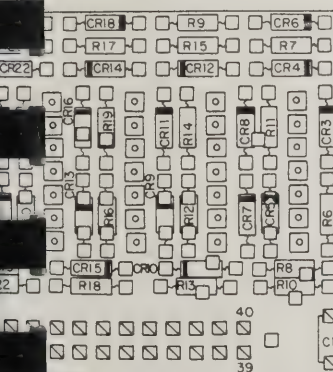
Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Frequency switchboard	635-0830-001	REV H
Frequency switchboard	635-0830-002	REV H

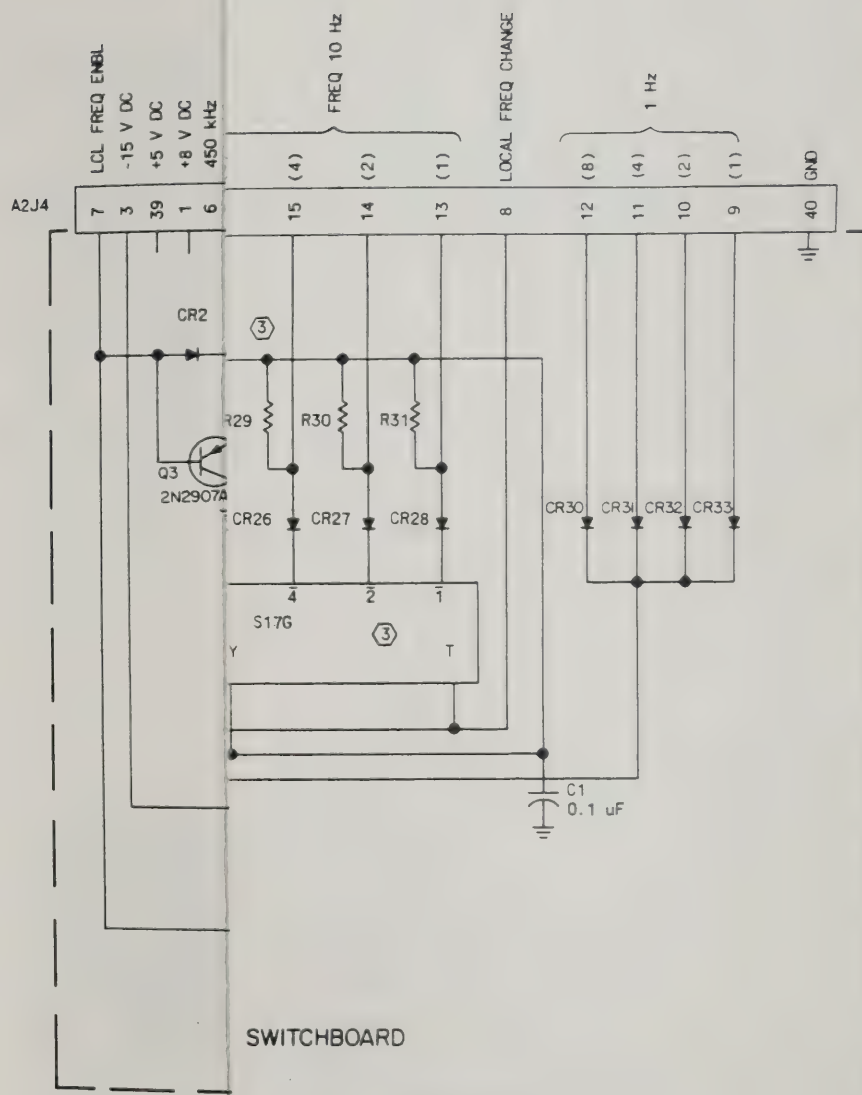


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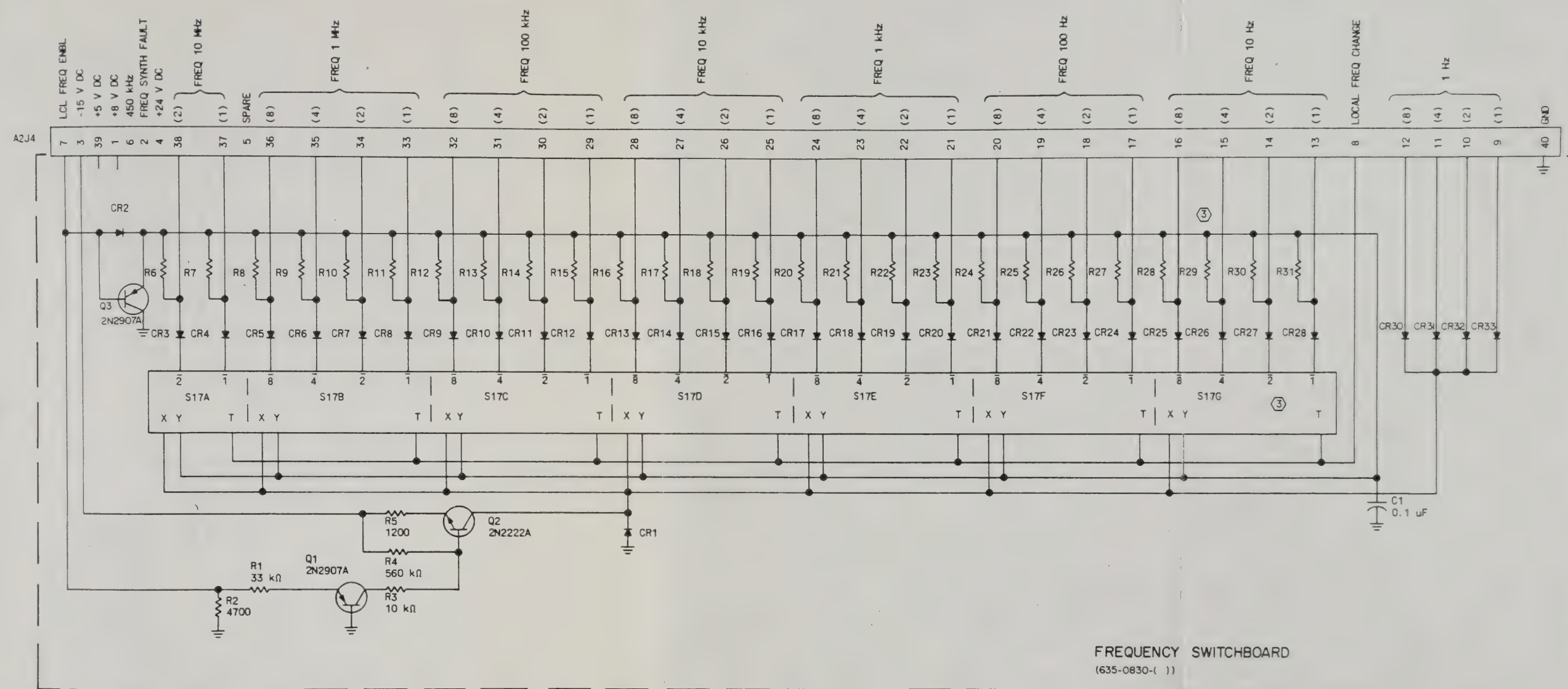


NOTES:

- ① ALL DIODES
- ② UNLESS OT
- ③ THE 10 Hz
PART OF 6
ARE CONNE

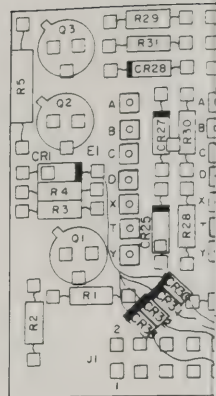
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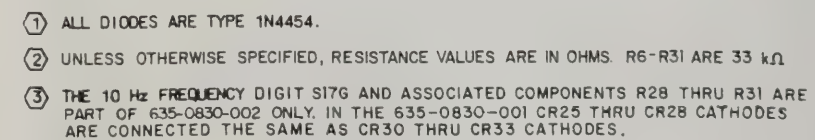
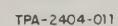
Frequency Switchboard, Schematic Diagram
Figure 2 (Sheet 1 of 2)



NOTES:

- ① ALL DIODES ARE TYPE 1N4454.
- ② UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS. R6-R31 ARE 33 k Ω .
- ③ THE 10 Hz FREQUENCY DIGIT S17G AND ASSOCIATED COMPONENTS R28 THRU R31 ARE PART OF 635-0830-002 ONLY. IN THE 635-0830-001 CR25 THRU CR28 CATHODES ARE CONNECTED THE SAME AS CR30 THRU CR33 CATHODES.





*Frequency Switchboard, Schematic Diagram
Figure 2 (Sheet 2)*

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
	FREQUENCY SWITCHBOARD	635-0830-001 A		
	FREQUENCY SWITCHBOARD	635-0830-002 B		
CR1-CR28	SEMICOND DEVICE	353-3644-010		0350
CR29	NOT USED			
CR30- CR33	SEMICOND DEVICE	353-3644-010		0350
C1	CAPACITOR,FXD CER DIEI, 0.1UF, PORM10%, 50V	913-5019-320		8134
J4	HOUSING,CONN,EL	372-0043-480		0077
Q1	TRANSISTOR	352-0551-010		0471
Q2	TRANSISTOR	352-0661-020		0726
Q3	TRANSISTOR	352-0551-010		0471
R1	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		8134
R2	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		8134
R3	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		8134
R4	RESISTOR,FXD CMPSN, 560K, 10%, 1/8W	745-2440-000		8134
R5	RESISTOR,FXD CMPSN, 1.2K, 10%, 1/4W	745-0752-000		8134
R6-R27	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		8134
R28-R31	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000 B		8134
S1	SWITCH ASSEMBLY	259-9651-010 A		0712
S1	SWITCH ASSEMBLY	259-9651-020 B		0712

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	FREQUENCY SWITCHBOARD	635-0830-001	A		
	FREQUENCY SWITCHBOARD	635-0830-002	B		
CR1-CR28	SEMICOND DEVICE	353-3644-010		03508	1N4454GE
CR29	NOT USED				
CR30-	SEMICOND DEVICE	353-3644-010		03508	1N4454GE
CR33					
C1	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 50V	913-5019-320		81349	CK05BX104K
J4	HOUSING,CONN,EL	372-0043-480		00779	87478-7
Q1	TRANSISTOR	352-0551-010		04713	2N2907A
Q2	TRANSISTOR	352-0661-020		07263	2N2222A
Q3	TRANSISTOR	352-0551-010		04713	2N2907A
R1	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R2	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R3	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R4	RESISTOR,FXD CHPSN, 560K, 10%, 1/8W	745-2440-000		81349	RCR05G564KS
R5	RESISTOR,FXD CHPSN, 1.2K, 10%, 1/4W	745-0752-000		81349	RCR07G122KS
R6-R27	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R28-R31	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000	B	81349	RCR05G333KS
S1	SWITCH ASSEMBLY	259-9651-010	A	07126	29C63
S1	SWITCH ASSEMBLY	259-9651-020	B	07126	29C64



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0770518-001211

1 October 1980

DVBFO Switchboard
(638-6437-001)

DVBFO Switchboard (638-6437-001)

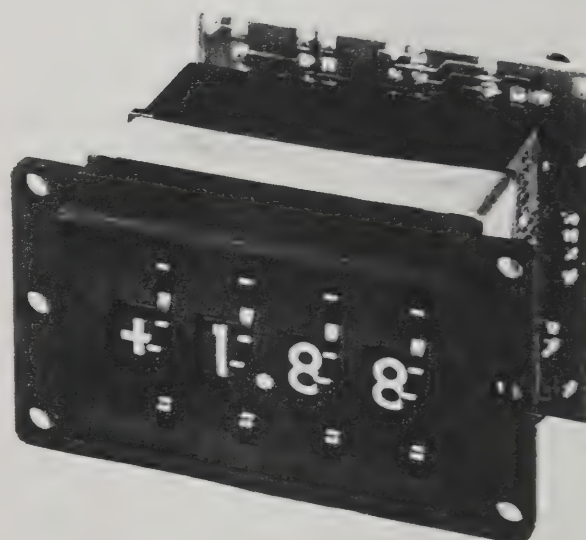
Printed in USA

1. DESCRIPTION

The DVBFO Switchboard 638-6437-001, shown in figure 1, consists of a 4-section thumb-wheel frequency selector switch with sign, a local frequency enable circuit, and logic pullup for logic outputs.

The dvbfo switchboard is used to generate a frequency offset output. This is accomplished by setting the thumb-wheel frequency selector switches to the appropriate digits of the desired frequency, and a parallel bcd frequency control output is supplied. Refer to table 1 for a logic truth table, and to figure 2 for the bcd output pins.

Refer to the dvbfo switchboard schematic, figure 2. The S18A section of the thumbwheel switch is used to generate a (+) or (-) sign output. With S18A set to the (+) position the output equals a logic 0, and in the (-) position the output equals a logic 1.



TPA-2447-017

DVBFO Switchboard
Figure 1

Table 1. DVBFO Switchboard, Logic Truth Table.

FREQUENCY DIGIT	SELECTOR (Hz)	1000 (S18B)				100 (S18C)				10 (S18D)			
	BCD OUTPUT	8	4	2	1	8	4	2	1	8	4	2	1
	A2J6 PIN NO	13	12	11	10	9	8	7	6	5	4	3	2
0		0	0	0	0	0	0	0	0	0	0	0	0
1		0	0	0	1	0	0	0	1	0	0	0	1
2		0	0	1	0	0	0	1	0	0	0	1	0
3		0	0	1	1	0	0	1	1	0	0	1	1
4		0	1	0	0	0	1	0	0	0	1	0	0

523-0770518-001211

Table 1. DVBFO Switchboard, Logic Truth Table (Cont).

FREQUENCY DIGIT	SELECTOR (Hz)	1000 (S18B)				100 (S18C)				10 (S18D)			
	BCD OUTPUT	8	4	2	1	8	4	2	1	8	4	2	1
	A2J6 PIN NO	13	12	11	10	9	8	7	6	5	4	3	2
5		0	1	0	1	0	1	0	1	0	1	0	1
6		0	1	1	0	0	1	1	0	0	1	1	0
7		0	1	1	1	0	1	1	1	0	1	1	1
8		1	0	0	0	1	0	0	0	1	0	0	0
9		1	0	0	1	1	0	0	1	1	0	0	1

2. TESTING/TROUBLESHOOTING PROCEDURES

2.1 Test Equipment and Power Requirements

Test equipment and power required to test, troubleshoot, and repair the dvbfo switchboard are listed in the maintenance section of the related instruction book.

2.2 Testing

The test procedures in table 2 check the total performance of the dvbfo switchboard. These test

procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

3. REPAIR

Repair of the dvbfo switchboard is accomplished using the standard planar card repair procedures. Refer to the maintenance section of the related instruction book for planar card repair procedures.

Table 2. DVBFO Switchboard, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit containing dvbfo switchboard to be tested. Note Testing procedures (test 2) on dvbfo switchboard used in the controls (HF-8090/8091/8092) can be accomplished with the top cover in place. b. If control unit, remove parallel input card A11. Install it on an extender card and place it in the control unit. c. Apply power to unit.		
2. Testing procedures when installed in control	a. Set CONT switch to LCL, set VBFO switch to VAR. b. Rotate dvbfo frequency switches through their complete range.	Note that dvbfo frequency display readout agrees with frequency switch setting.	Proceed to test 3.

Table 2. DVBFO Switchboard, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																																																																																																																																							
3. Testing and troubleshooting procedures	a. Set CONT switch to LCL, set VBFO switch to VAR. b. Connect dvm to first connector pin shown in chart. c. Rotate associated thumb wheel through its range. d. Repeat steps b and c for each connector pin shown on card.	Refer to chart.	If no logic 1 indications, check Q3 and CR2. If no logic 0 indications, check Q1, Q2, and associated components. If other malfunctions exist, check components associated with A2J6 pin number of thumb wheel in question.																																																																																																																																																																																							
	<table><tr><th rowspan="2">THUMB WHEEL (kHz)</th><th rowspan="2">BCD OUTPUT</th><th rowspan="2">EXTENDER PIN NO</th><th rowspan="2">A2J6 PIN NO</th><th colspan="10">THUMB-WHEEL POSITION</th></tr><tr><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th></tr><tr><td rowspan="4">1000</td><td>8</td><td></td><td>13</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>4</td><td></td><td>12</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>2</td><td></td><td>11</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td></td><td>10</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td rowspan="4">100</td><td>8</td><td></td><td>9</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>4</td><td></td><td>8</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>2</td><td></td><td>7</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td></td><td>6</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td rowspan="4">10</td><td>8</td><td></td><td>5</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>4</td><td></td><td>4</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>2</td><td></td><td>3</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td></td><td>2</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr></table>			THUMB WHEEL (kHz)	BCD OUTPUT	EXTENDER PIN NO	A2J6 PIN NO	THUMB-WHEEL POSITION										0	1	2	3	4	5	6	7	8	9	1000	8		13	0	0	0	0	0	0	0	0	1	1	4		12	0	0	0	0	1	1	1	1	0	0	2		11	0	0	1	1	0	0	1	1	0	0	1		10	0	1	0	1	0	1	0	1	0	1	100	8		9	0	0	0	0	0	0	0	0	1	1	4		8	0	0	0	0	1	1	1	1	0	0	2		7	0	0	1	1	0	0	1	1	0	0	1		6	0	1	0	1	0	1	0	1	0	1	10	8		5	0	0	0	0	0	0	0	0	1	1	4		4	0	0	0	0	1	1	1	1	0	0	2		3	0	0	1	1	0	0	1	1	0	0	1		2	0	1	0	1	0	1	0	1	0	1
	THUMB WHEEL (kHz)							BCD OUTPUT	EXTENDER PIN NO	A2J6 PIN NO	THUMB-WHEEL POSITION																																																																																																																																																																															
0		1	2	3	4	5	6				7	8	9																																																																																																																																																																													
1000	8		13	0	0	0	0	0	0	0	0	1	1																																																																																																																																																																													
	4		12	0	0	0	0	1	1	1	1	0	0																																																																																																																																																																													
	2		11	0	0	1	1	0	0	1	1	0	0																																																																																																																																																																													
	1		10	0	1	0	1	0	1	0	1	0	1																																																																																																																																																																													
100	8		9	0	0	0	0	0	0	0	0	1	1																																																																																																																																																																													
	4		8	0	0	0	0	1	1	1	1	0	0																																																																																																																																																																													
	2		7	0	0	1	1	0	0	1	1	0	0																																																																																																																																																																													
	1		6	0	1	0	1	0	1	0	1	0	1																																																																																																																																																																													
10	8		5	0	0	0	0	0	0	0	0	1	1																																																																																																																																																																													
	4		4	0	0	0	0	1	1	1	1	0	0																																																																																																																																																																													
	2		3	0	0	1	1	0	0	1	1	0	0																																																																																																																																																																													
	1		2	0	1	0	1	0	1	0	1	0	1																																																																																																																																																																													
Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.																																																																																																																																																																																										
4. Dvbfo frequency change signal	Note Applicable only to dvbfo switchboards installed in control units. a. Set CONT switch to NORM. b. Connect dvm to A11 extender. c. Slowly rotate each dvbfo frequency switch through its complete range.	Note a logic 0 spike between each switch position.	Replace associated switch thumb wheel.																																																																																																																																																																																							

Table 2. DVBFO Switchboard, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. Local/remote operation	Note Applicable only to dvbfo frequency switchboards installed in local units. a. Set CONT switch to REM. b. Rotate all dvbfo frequency switches through their complete range.	Note the voltage at the associated A2J6 pins for each setting of each switch. 0 V on all pins.	Unit malfunction.

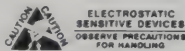
4. PARTS LIST/DIAGRAMS

4.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 2). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts

in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

4.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

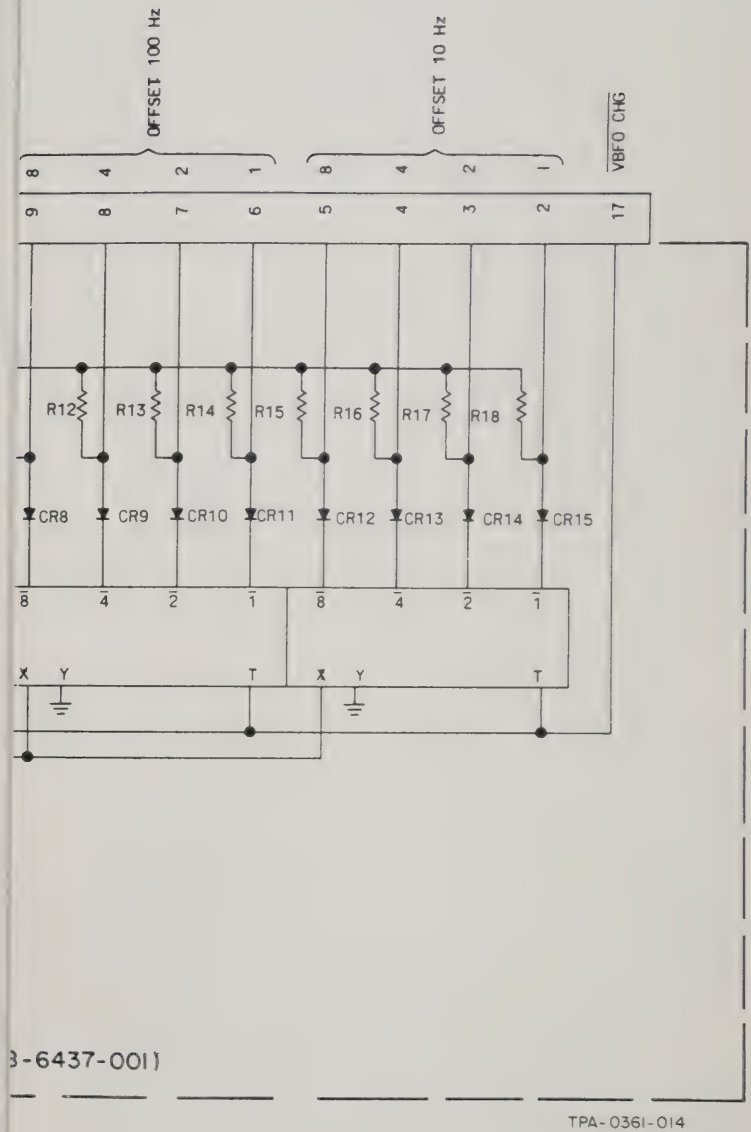
Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
07126	DIGITRAN CO THE 855 SOUTH ARROYO PARKWAY PASADENA CA 91105
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
15818	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
81349	MILITARY SPECIFICATION

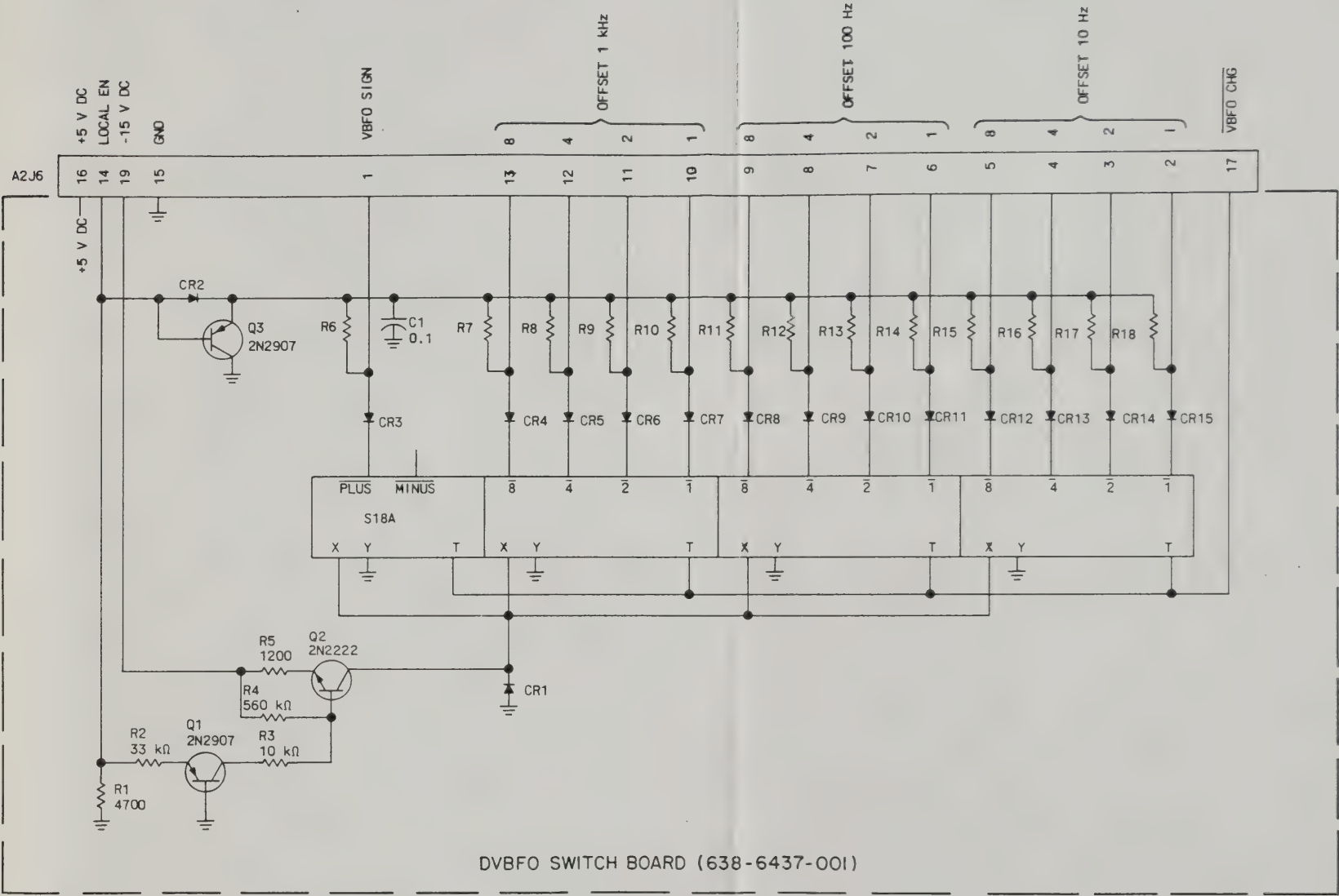
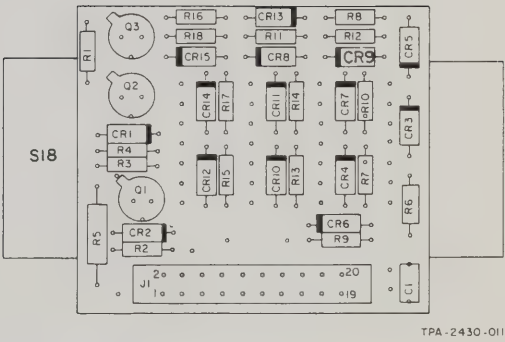
4.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Dvbfo switchboard	638-6437-001	REV A



DVBFO Switchboard, Schematic Diagram
Figure 2 (Sheet 1 of 2)



- NOTES:
- 1 UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, AND DIODES ARE IN4454.
 - 2 R6-R18 ARE 33 kΩ.

DVBFO Switchboard, Schematic Diagram
Figure 2 (Sheet 1 of 2)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR COD
	DVBFO SWITCHBOARD	638-6437-001		
CR1-CR15	SEMICOND DEVICE	353-3644-010		0350
C1	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 50V	913-5019-320		8134
J1	HOUSING,CONN,EL	372-0043-380		0077
Q1	TRANSISTOR	352-0551-010		1581
Q2	TRANSISTOR	352-0661-020		0726
Q3	TRANSISTOR	352-0551-010		1581
R1	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		8134
R2	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		8134
R3	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		8134
R4	RESISTOR,FXD CMPSN, 560K, 10%, 1/8W	745-2440-000		8134
R5	RESISTOR,FXD CMPSN, 1.2K, 10%, 1/4W	745-0752-000		8134
R6-R18	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		8134
S1-S17	NOT USED			
S18	SWITCH ASSEMBLY	259-9651-060		0712

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	DVBFO SWITCHBOARD	638-6437-001			
CR1-CR15	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
C1	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 50V	913-5019-320		81349	CK058X104K
J1	HOUSING,CONN,EL	372-0043-380		00779	87478-3
Q1	TRANSISTOR	352-0551-010		15818	2N2907A
Q2	TRANSISTOR	352-0661-020		07263	2N2222A
Q3	TRANSISTOR	352-0551-010		15818	2N2907A
R1	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R2	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R3	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R4	RESISTOR,FXD CMPSN, 560K, 10%, 1/8W	745-2440-000		81349	RCR05G564KS
R5	RESISTOR,FXD CMPSN, 1.2K, 10%, 1/4W	745-0752-000		81349	RCR07G122KS
R6-R18	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
S1-S17	NOT USED				
S18	SWITCH ASSEMBLY	259-9651-060		07126	29C80

DVBFO Switchboard, Schematic Diagram
Figure 2 (Sheet 2)



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0767975-004211

4th Edition, 1 June 1979

Frequency Display (637-1781-())

Printed in USA

1. DESCRIPTION

The Frequency Display 635-1781-() consists of two subassemblies hard-wired together. One subassembly, the frequency display driver board, contains the logic and decoder/driver circuits. The other, the frequency display board, contains the 7-segment displays. The subassemblies are 2-layer circuit boards with a cable connector on the section containing the decoder/drivers. Figure 1 is a picture of the assembled subassemblies.



TP5-2370-017

Frequency Display
Figure 1

2. PRINCIPLES OF OPERATION

2.1 General

The frequency display configuration differences are as follows:

- 637-1781-001, -006, 100 Hz operating frequency display and no BFO frequency display.
- 637-1781-002, -007, 10 Hz operating frequency display and no BFO frequency display.
- 637-1781-003, -008, 10 Hz operating frequency display and BFO frequency display of $\pm 0-9990$ Hz (operating frequency can be expanded to 1 Hz by adding display device U27).
- 637-1781-004, -009, 1 Hz operating frequency display and BFO frequency display of $\pm 0-9990$ Hz.
- 637-1781-005, -010, 100 Hz operating frequency display and no BFO frequency display (can be expanded to 10/1 Hz operating frequency display and/or BFO frequency display by adding display devices U26/U27 and/or U15 through U19).

2.2 Theory of Operation (Refer to figure 4.)

For each frequency digit, a 4-bit binary input is applied to the decoder/driver. This input data is decoded into seven binary outputs. These logic-level outputs are applied directly to the 7-segment display associated with the decoder/driver. Each output causes a certain LED segment to light to form a part of the numeral equivalent to the 4-bit binary input to the board.

Figure 2 shows the decoder/driver input-output truth table and the 7-segment display connections.

The units and tens megahertz displays are blanked if the frequency is not within the 1- to 30-MHz range (for which these digits would be needed). This suppresses the leading zeros in lower frequency displays. The blanking (suppression) input ($\overline{BI}$ at logic 0 level) is generated by OR gates U6B-U6D. When all inputs

NOTICE: This section replaces third edition dated 1 January 1979.

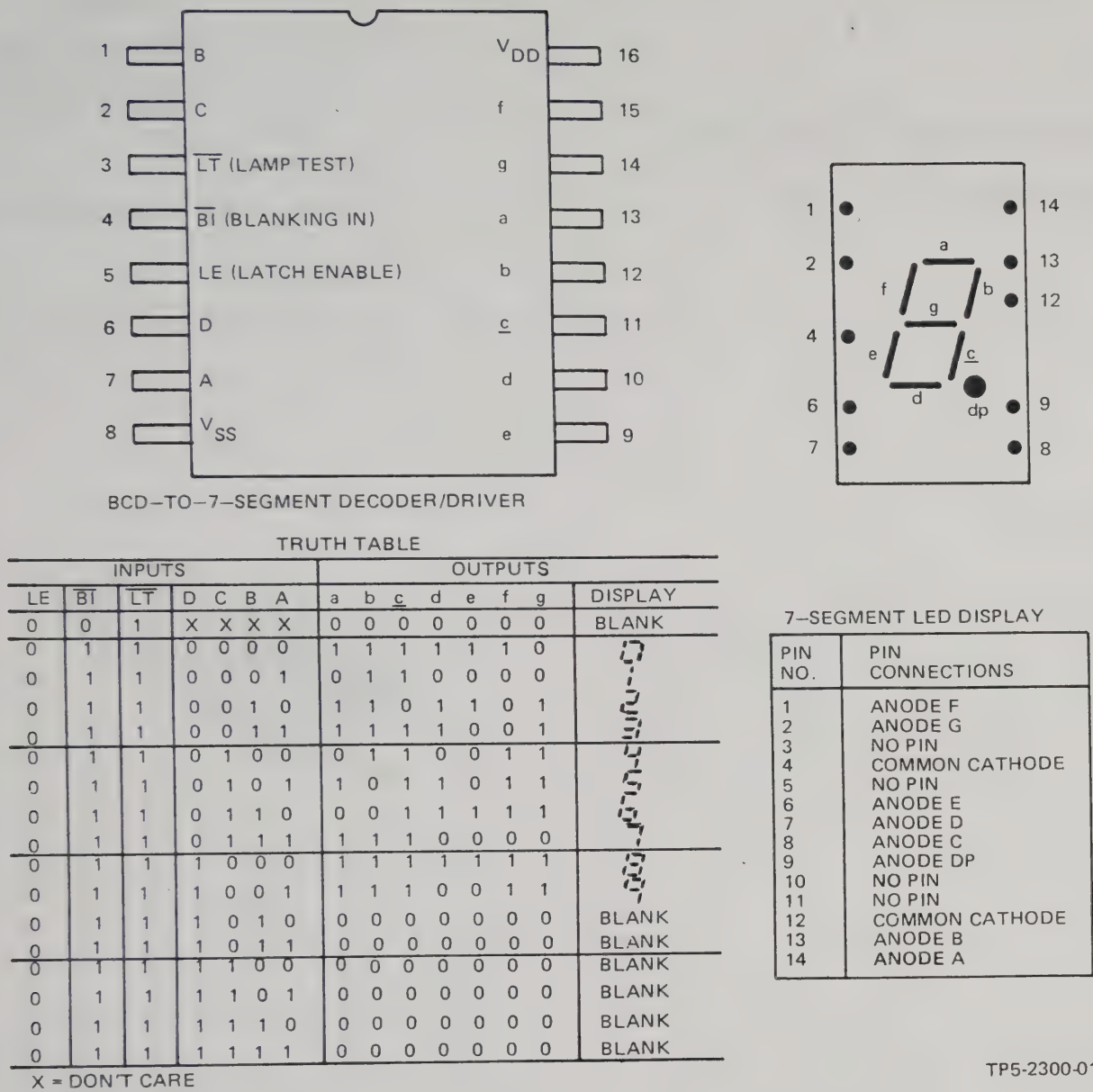


Table 1. Frequency Display Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICA TION	IF INDICATION IS ABNORMAL																																	
1. Test setup	Set PWR switch on and CONT switch to TEST. Set FREQUENCY KHZ display for all O's.																																			
2. Zero sup- pression and deci- mal point display	Set FREQUENCY KHZ dis- play for 500 kHz. Observe FREQUENCY KHZ read- out display.	Units' and tens' zeros of MHz range suppressed (blanked). Zeros for kHz and tenths displayed. Decimal point after fifth digit from left displayed.	If MHz-range zeros displayed, check U6B, U6C, U6D, and U7. If decimal point not displayed, check U24.																																	
3. Digit se- lection and display (applicable only when used with thumb- wheel frequency control switches)	Rotate each FREQUENCY kHz switch through all its positions. (Leftmost switch has positions 0, 1, and 2 only.) Observe readout display to see that corresponding se- lected digit is displayed. <i>Note</i> Wait approx 1 second after switching for time delay to elapse and circuit to strobe in new digit. If switch is changed too slowly, strobe signal may be generated while old number is still applied to circuit. In this case, the new number will not be displayed even though switch is set to new po- sition. Switch away from and back to new position if this occurs.	Readout digit displayed corresponds to that selected on thumb- wheel switch.	Refer to schematic diagram and check decoder/driver and readout unit corresponding to digit showing malfunction. For normal display, decoder/driver inputs and outputs at logic 1 are listed below for each digit. <table><tr><th>DIGIT</th><th>INPUTS</th><th>OUTPUTS</th></tr><tr><td>0</td><td>(all 0's)</td><td>a+b+c+d+e+f</td></tr><tr><td>1</td><td>A</td><td>b+c</td></tr><tr><td>2</td><td>B</td><td>a+b+c+e+g</td></tr><tr><td>3</td><td>A+B</td><td>a+b+c+d+g</td></tr><tr><td>4</td><td>C</td><td>b+c+f+g</td></tr><tr><td>5</td><td>A+C</td><td>a+c+d+f+g</td></tr><tr><td>6</td><td>B+C</td><td>c+d+e+f+g</td></tr><tr><td>7</td><td>A+B+C</td><td>a+b+c</td></tr><tr><td>8</td><td>D</td><td>a+b+c+d+e+f+g</td></tr><tr><td>9</td><td>A+D</td><td>a+b+c+f+g</td></tr></table>	DIGIT	INPUTS	OUTPUTS	0	(all 0's)	a+b+c+d+e+f	1	A	b+c	2	B	a+b+c+e+g	3	A+B	a+b+c+d+g	4	C	b+c+f+g	5	A+C	a+c+d+f+g	6	B+C	c+d+e+f+g	7	A+B+C	a+b+c	8	D	a+b+c+d+e+f+g	9	A+D	a+b+c+f+g
DIGIT	INPUTS	OUTPUTS																																		
0	(all 0's)	a+b+c+d+e+f																																		
1	A	b+c																																		
2	B	a+b+c+e+g																																		
3	A+B	a+b+c+d+g																																		
4	C	b+c+f+g																																		
5	A+C	a+c+d+f+g																																		
6	B+C	c+d+e+f+g																																		
7	A+B+C	a+b+c																																		
8	D	a+b+c+d+e+f+g																																		
9	A+D	a+b+c+f+g																																		
4. Frequency display (applicable only when used with incremen- tal tuning frequency control)	Set DIAL switch to FINE. Rotate TUNING dial through complete frequency range and observe FREQUENCY KHZ display.	All digits are displayed in sequence through complete frequency range of unit under test.	Same as test 3.																																	

Table 1. Frequency Display Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. Vbfo digit selection and display (applicable only when used with thumb-wheel dvbfo control switches)	Set BFO switch to VAR. Rotate each VBFO OFFSET Hz switch through all its positions. Observe readout display to see that corresponding selected digit is displayed. Note Wait approx 1 second after switching for time delay to elapse and circuit to strobe in new digit. If switch is changed too slowly, strobe signal may be generated while old number is still applied to circuit. In this case, the new number will not be displayed even though switch is set to new position. Switch away from and back to new position if this occurs.	Readout digit displayed corresponds to that selected on thumb-wheel switch.	Same as test 3.
6. Vbfo display (applicable only when used with incremental tuning vbfo control)	Set BFO switch to TUNE. Rotate TUNING dial through complete vbfo range and observe VBFO OFFSET HZ display.	All digits are displayed in sequence through complete vbfo range of unit under test.	Same as test 3.

4. REPAIR

Repair of the frequency display is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

5. PARTS LIST/DIAGRAMS

This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 3). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

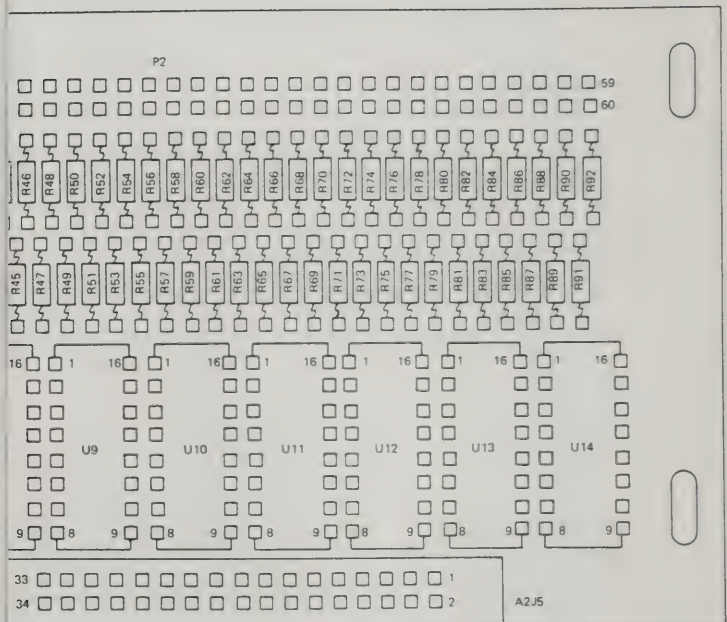
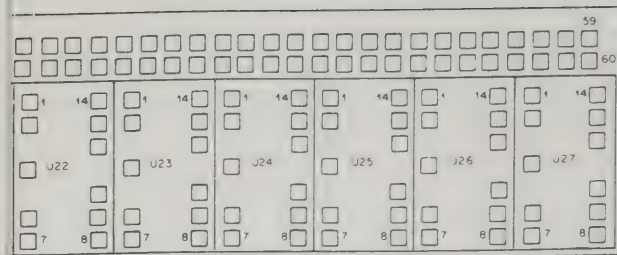
Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV)

stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>COLLINS CIRCUIT CARD/ SUBASSEMBLY</u>	<u>PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Frequency Display	637-1781-001	REV B
Frequency Display	637-1781-002	REV B
Frequency Display	637-1781-003	REV F
Frequency Display	637-1781-004	REV F
Frequency Display	637-1781-005	REV F
Frequency Display	637-1781-006	REV G
Frequency Display	637-1781-007	REV G
Frequency Display	637-1781-008	REV G
Frequency Display	637-1781-009	REV G
Frequency Display	637-1781-010	REV G
Frequency Display Driver Board	635-0896-001	REV H
Frequency Display Driver Board	635-0896-002	REV H
Frequency Display Driver Board	635-0896-004	REV G
Frequency Display Board	635-0897-001	REV C
Frequency Display Board	635-0897-002	REV C
Frequency Display Board	635-0897-003	REV D
Frequency Display Board	635-0897-004	REV E
Frequency Display Board	635-0897-005	REV F
Frequency Display Board	635-0897-006	REV F
Frequency Display Board	635-0897-007	REV F
Frequency Display Board	635-0897-008	REV F



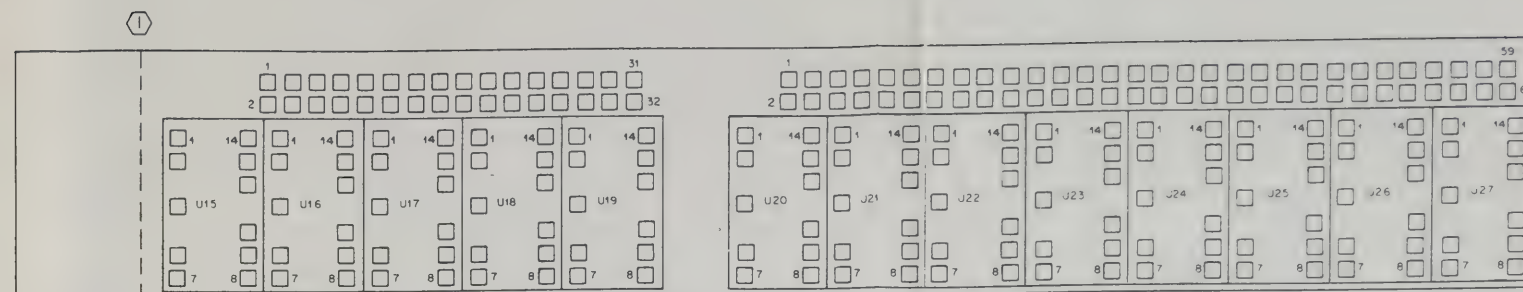
96 - ()

NOTE:

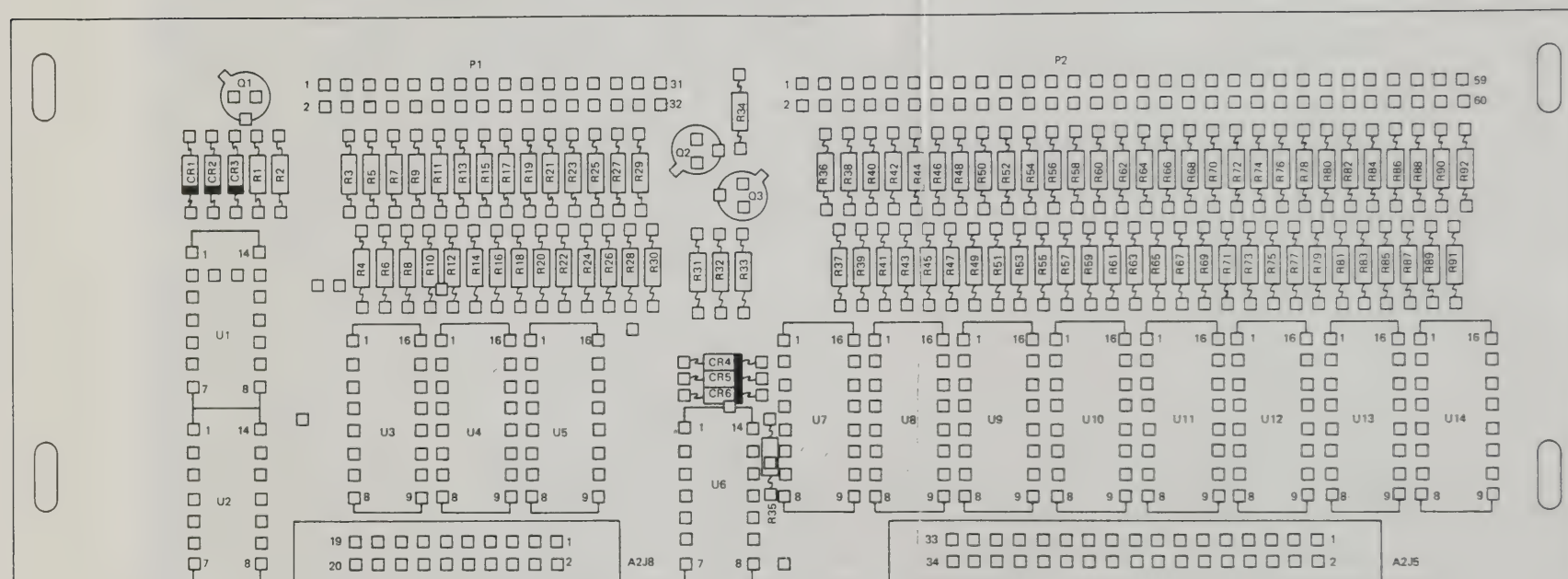
- ① FREQUENCY DISPLAY BOARD
635-0895-005, -006, -007, AND
-008 IS A SHORTENED BOARD.

TP5-1039-014

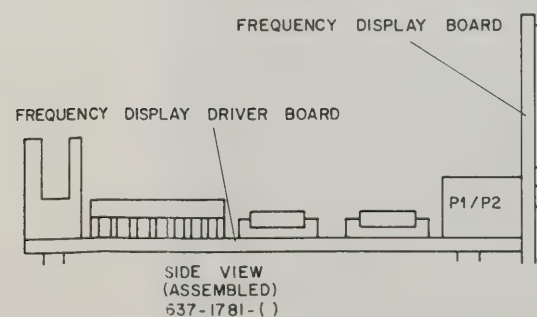
Frequency Display, Schematic Diagram
Figure 3 (Sheet 1 of 4)



FREQUENCY DISPLAY BOARD 635-0897-()



FREQUENCY DISPLAY DRIVER BOARD 635-0896-()



NOTE:

- ① FREQUENCY DISPLAY BOARD 635-0895-005, -006, -007, AND -008 IS A SHORTENED BOARD.

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFI COI
	FREQUENCY DISPLAY	637-1781-001	A	
	FREQUENCY DISPLAY	637-1781-002	B	
	FREQUENCY DISPLAY	637-1781-003	C	
	FREQUENCY DISPLAY	637-1781-004	D	
	FREQUENCY DISPLAY	637-1781-005	E	
	FREQUENCY DISPLAY	637-1781-006	F	
	FREQUENCY DISPLAY	637-1781-007	G	
	FREQUENCY DISPLAY	637-1781-008	H	
	FREQUENCY DISPLAY	637-1781-009	J	
	FREQUENCY DISPLAY	637-1781-010	K	
	FREQUENCY DISPLAY DRIVER BD	635-0896-001	A,F	
	FREQUENCY DISPLAY DRIVER BD	635-0896-002	B,G	
	FREQUENCY DISPLAY DRIVER BD	635-0896-004	C,D,E,H J,K	
	FREQUENCY DISPLAY BD	635-0897-001	A,E	
	FREQUENCY DISPLAY BD	635-0897-002	B	
	FREQUENCY DISPLAY BD	635-0897-003	C	
	FREQUENCY DISPLAY BD	635-0897-004	D	
	FREQUENCY DISPLAY BD	635-0897-005	F,K	
	FREQUENCY DISPLAY BD	635-0897-006	G	
	FREQUENCY DISPLAY BD	635-0897-007	H	
	FREQUENCY DISPLAY BD	635-0897-008	J	
	FREQUENCY DISPLAY DRIVER BD	635-0896-001		
CR1-CR3	NOT USED			
CR4-CR6	SEMICOND DEVICE 1N4454	353-3644-010		035
J1-J4	NOT USED			
J5	HOUSING,CONN,EL	372-0043-450		007
P1	CONNECTOR,HDR	372-0028-030		007
P2	CONNECTOR,HDR	372-0028-040		007
R1-R34	NOT USED			
R35	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/8W	745-2449-000		813
R36-R78	RESISTOR,FXD CMPSN, 180 OHMS, 10%, 1/8W	745-2314-000		813
U1-U5	NOT USED			
U6	INTEGRATED CIRCUIT MC14071BCP	351-8287-010		047
U7-U12	INTEGRATED CIRCUIT MC14511BCP	351-8304-010		047
	FREQUENCY DISPLAY DRIVER BD	635-0896-002	B,G	
CR1-CR3	NOT USED			
CR4-CR6	SEMICOND DEVICE 1N4454	353-3644-010		035
J1-J4	NOT USED			
J5	HOUSING,CONN,EL	372-0043-450		007
P1	CONNECTOR,HDR	372-0028-030		007
P2	CONNECTOR,HDR	372-0028-040		007
R1-R34	NOT USED			
R35	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/8W	745-2449-000		813
R36-R85	RESISTOR,FXD CMPSN, 180 OHMS, 10%, 1/8W	745-2314-000		813
U1-U5	NOT USED			
U6	INTEGRATED CIRCUIT MC14071BCP	351-8287-010		047
U7-U13	INTEGRATED CIRCUIT MC14511BCP	351-8304-010		047
	FREQUENCY DISPLAY DRIVER BD	635-0896-004	C,D,E,H J,K	
CR1-CR6	SEMICOND DEVICE 1N4454	353-3644-010		035
J1-J4	NOT USED			
J5	HOUSING,CONN,EL	372-0043-450		007
J6,J7	NOT USED			
J8	HOUSING,CONN,EL	372-0043-380		007
Q1-Q3	TRANSISTOR 2N2222A	352-0661-020		072
R1	RESISTOR,FXD CMPSN, 470K, 10%, 1/8W	745-2437-000		813
R2	RESISTOR,FXD CMPSN, 47K, 10%, 1/8W	745-2401-000		813
R3-R30	RESISTOR,FXD CMPSN, 180 OHMS, 10%, 1/8W	745-2314-000		813
R31	RESISTOR,FXD CMPSN, 100K, 10%, 1/8W	745-2413-000		813
R32	RESISTOR,FXD CMPSN, 470K, 10%, 1/8W	745-2437-000		813
R33	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/8W	745-2362-000		813
R34	RESISTOR,FXD CMPSN, 470K, 10%, 1/8W	745-2437-000		813
R35	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/8W	745-2449-000		813
R36-R92	RESISTOR,FXD CMPSN, 180 OHMS, 10%, 1/8W	745-2314-000		813
U1	INTEGRATED CIRCUIT MC14081BCP	351-8287-030		047
U2	INTEGRATED CIRCUIT MC14072BCP	351-8287-040		047
U3-U5	INTEGRATED CIRCUIT MC14511BCP	351-8304-010		047
U6	INTEGRATED CIRCUIT MC14071BCP	351-8287-010		047
U7-U14	INTEGRATED CIRCUIT MC14511BCP	351-8304-010		047
	FREQUENCY DISPLAY BD	635-0897-001	A,E	
U1-U19	NOT USED			
U20-U25	SEMICOND DEVICE MAN3640A	262-1461-010		503
	FREQUENCY DISPLAY BD	635-0897-002	B	
U1-U19	NOT USED			
U20-U26	SEMICOND DEVICE MAN3640A	262-1461-010		503
	FREQUENCY DISPLAY BD	635-0897-003	C	
U1-U14	NOT USED			
U15-U27	SEMICOND DEVICE MAN3640A	262-1461-010		503
	FREQUENCY DISPLAY BD	635-0897-004	D	
U1-U14	NOT USED			
U15-U27	SEMICOND DEVICE MAN3640A	262-1461-010		503
	FREQUENCY DISPLAY BD	635-0897-005	F,K	
U1-U19	NOT USED			
U20-U25	SEMICOND DEVICE MAN3640A	262-1461-010		503

503atic Diagram

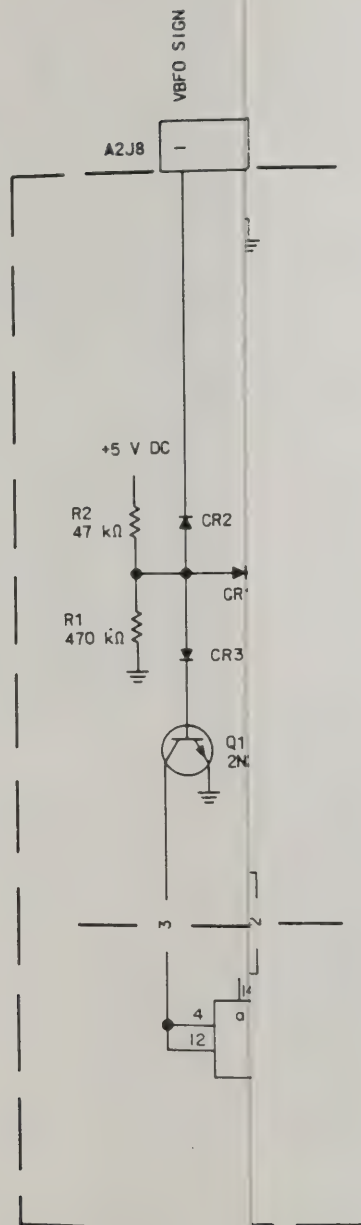
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	FREQUENCY DISPLAY	637-1781-001	A		
	FREQUENCY DISPLAY	637-1781-002	B		
	FREQUENCY DISPLAY	637-1781-003	C		
	FREQUENCY DISPLAY	637-1781-004	D		
	FREQUENCY DISPLAY	637-1781-005	E		
	FREQUENCY DISPLAY	637-1781-006	F		
	FREQUENCY DISPLAY	637-1781-007	G		
	FREQUENCY DISPLAY	637-1781-008	H		
	FREQUENCY DISPLAY	637-1781-009	J		
	FREQUENCY DISPLAY	637-1781-010	K		
	FREQUENCY DISPLAY DRIVER BD	635-0896-001	A,F		
	FREQUENCY DISPLAY DRIVER BD	635-0896-002	B,G		
	FREQUENCY DISPLAY DRIVER BD	635-0896-004	C,D,E,H J,K		
	FREQUENCY DISPLAY BD	635-0897-001	A,E		
	FREQUENCY DISPLAY BD	635-0897-002	B		
	FREQUENCY DISPLAY BD	635-0897-003	C		
	FREQUENCY DISPLAY BD	635-0897-004	D		
	FREQUENCY DISPLAY BD	635-0897-005	F,K		
	FREQUENCY DISPLAY BD	635-0897-006	G		
	FREQUENCY DISPLAY BD	635-0897-007	H		
	FREQUENCY DISPLAY BD	635-0897-008	J		
	FREQUENCY DISPLAY DRIVER BD	635-0896-001			
CR1-CR3	NOT USED				
CR4-CR6	SEMICOND DEVICE 1N4454	353-3644-010		03508	1N4454GE
J1-J4	NOT USED				
J5	HOUSING,CONN,EL	372-0043-450		00779	87478-5
P1	CONNECTOR,HDR	372-0028-030		00779	1-87566-6
P2	CONNECTOR,HDR	372-0028-040		00779	3-87566-0
R1-R34	NOT USED				
R35	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	RCR05G105KS
R36-R78	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/8W	745-2314-000		81349	RCR05G181KS
U1-U5	NOT USED				
U6	INTEGRATED CIRCUIT MC14071BCP	351-8287-010		04713	MC14071BCP
U7-U12	INTEGRATED CIRCUIT MC14511BCP	351-8304-010		04713	MC14511BCP
	FREQUENCY DISPLAY DRIVER BD	635-0896-002	B,G		
CR1-CR3	NOT USED				
CR4-CR6	SEMICOND DEVICE 1N4454	353-3644-010		03508	1N4454GE
J1-J4	NOT USED				
J5	HOUSING,CONN,EL	372-0043-450		00779	87478-5
P1	CONNECTOR,HDR	372-0028-030		00779	1-87566-6
P2	CONNECTOR,HDR	372-0028-040		00779	3-87566-0
R1-R34	NOT USED				
R35	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	RCR05G105KS
R36-R85	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/8W	745-2314-000		81349	RCR05G181KS
U1-U5	NOT USED				
U6	INTEGRATED CIRCUIT MC14071BCP	351-8287-010		04713	MC14071BCP
U7-U13	INTEGRATED CIRCUIT MC14511BCP	351-8304-010		04713	MC14511BCP
	FREQUENCY DISPLAY DRIVER BD	635-0896-004	C,D,E,H J,K		
CR1-CR6	SEMICOND DEVICE 1N4454	353-3644-010		03508	1N4454GE
J1-J4	NOT USED				
J5	HOUSING,CONN,EL	372-0043-450		00779	87478-5
J6,J7	NOT USED				
J8	HOUSING,CONN,EL	372-0043-380		00779	87478-3
Q1-Q3	TRANSISTOR 2N2222A	352-0661-020		07263	2N2222A
R1	RESISTOR,FXD CHPSN, 470K, 10%, 1/8W	745-2437-000		81349	RCR05G474KS
R2	RESISTOR,FXD CHPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473KS
R3-R30	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/8W	745-2314-000		81349	RCR05G181KS
R31	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R32	RESISTOR,FXD CHPSN, 470K, 10%, 1/8W	745-2437-000		81349	RCR05G474KS
R33	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/8W	745-2362-000		81349	RCR05G392KS
R34	RESISTOR,FXD CHPSN, 470K, 10%, 1/8W	745-2437-000		81349	RCR05G474KS
R35	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	RCR05G105KS
R36-R92	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/8W	745-2314-000		81349	RCR05G181KS
U1	INTEGRATED CIRCUIT MC14091BCP	351-8287-030		04713	MC14091BCP
U2	INTEGRATED CIRCUIT MC14072BCP	351-8287-040		04713	MC14072BCP
U3-U5	INTEGRATED CIRCUIT MC14511BCP	351-8304-010		04713	MC14511BCP
U6	INTEGRATED CIRCUIT MC14071BCP	351-8287-010		04713	MC14071BCP
U7-U14	INTEGRATED CIRCUIT MC14511BCP	351-8304-010		04713	MC14511BCP
	FREQUENCY DISPLAY BD	635-0897-001	A,E		
U1-U19	NOT USED				
U20-U25	SEMICOND DEVICE MAN3640A	262-1461-010		50522	MAN3640A
	FREQUENCY DISPLAY BD	635-0897-002	B		
U1-U19	NOT USED				
U20-U26	SEMICOND DEVICE MAN3640A	262-1461-010		50522	MAN3640A
	FREQUENCY DISPLAY BD	635-0897-003	C		
U1-U14	NOT USED				
U15-U27	SEMICOND DEVICE MAN3640A	262-1461-010		50522	MAN3640A
	FREQUENCY DISPLAY BD	635-0897-004	D		
U1-U14	NOT USED				
U15-U27	SEMICOND DEVICE MAN3640A	262-1461-010		50522	MAN3640A
	FREQUENCY DISPLAY BD	635-0897-005	F,K		
U1-U19	NOT USED				
U20-U25	SEMICOND DEVICE MAN3640A	262-1461-010		50522	MAN3640A

PARTS LIST (Cont)

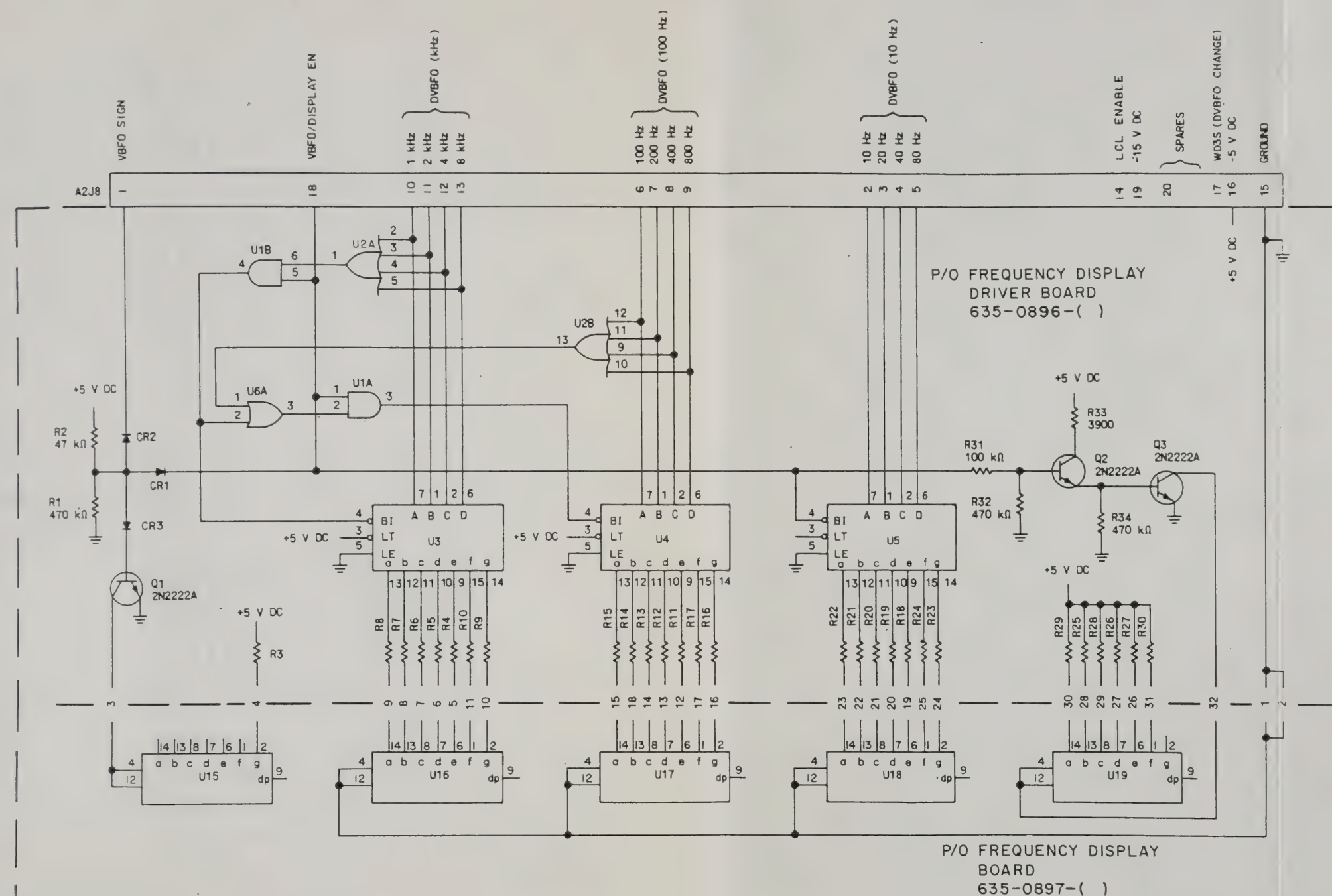
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	FREQUENCY DISPLAY BD	635-0897-006	G		
U1-U19	NOT USED				
U20-U26	SEMICOND DEVICE MAN3640A	262-1461-010		50522	MAN3640A
	FREQUENCY DISPLAY BD	635-0897-007	H		
U1-U14	NOT USED				
U15-U26	SEMICOND DEVICE MAN3640A	262-1461-010		50522	MAN3640A
	FREQUENCY DISPLAY BD	635-0897-008			
U1-U14	NOT USED				
U15-U26	SEMICOND DEVICE MAN3640A	262-1461-010		50522	MAN3640A

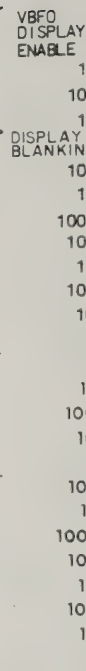
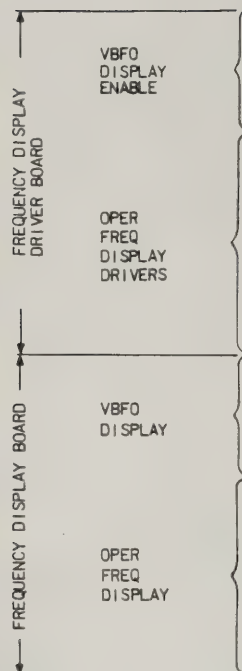
Frequency Display, Schematic Diagram
Figure 3 (Sheet 2)



Frequency Display, Schematic Diagram
Figure 3 (Sheet 3)

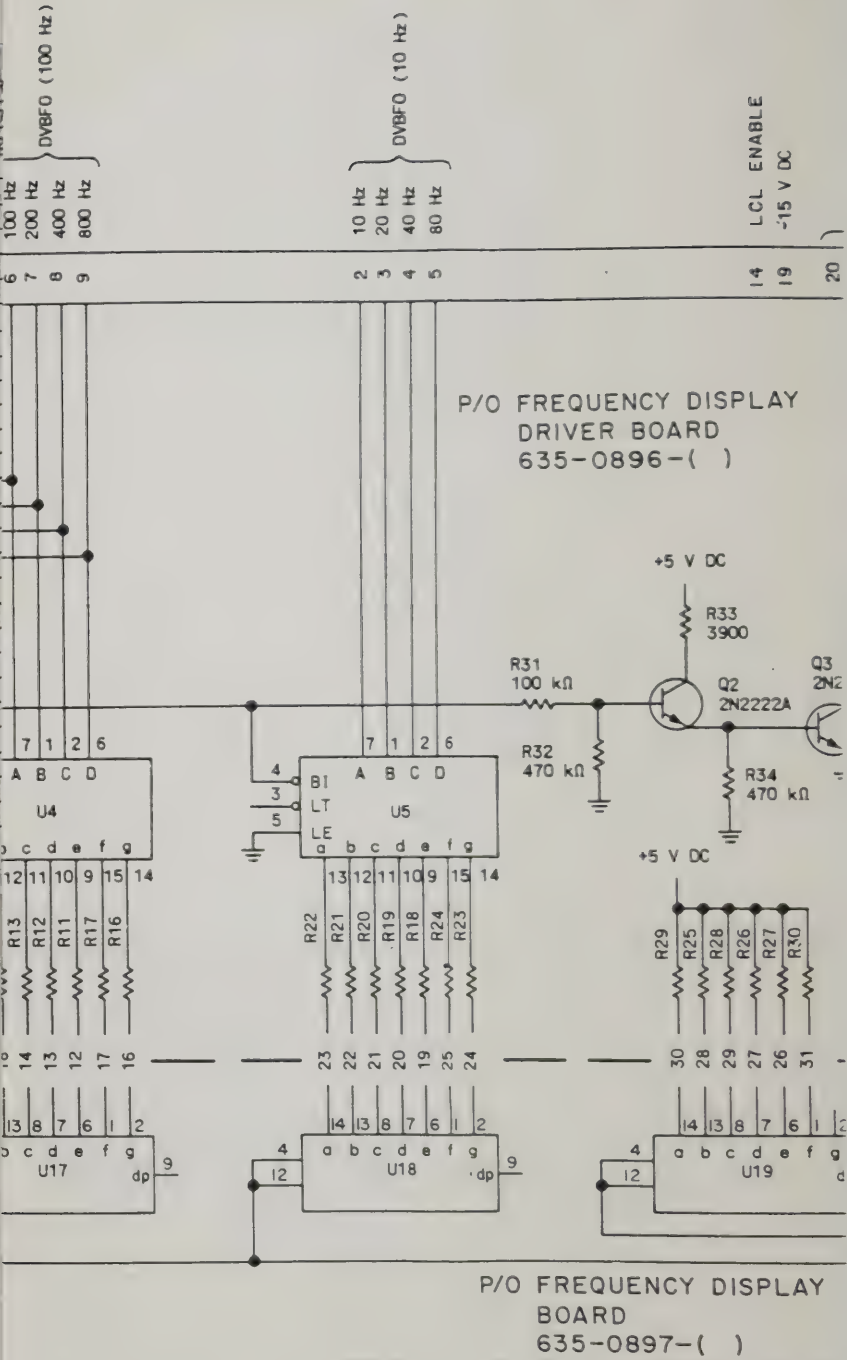
005	-006	-007	-008	-009	-010
X			x	x	x
X			x	x	x
X			x	x	x
X			x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
X			x	x	x
			x	x	
			x	x	
			x	x	
			x	x	
X	x	x	x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
X	x	x	x	x	x
			x	x	
			x	x	

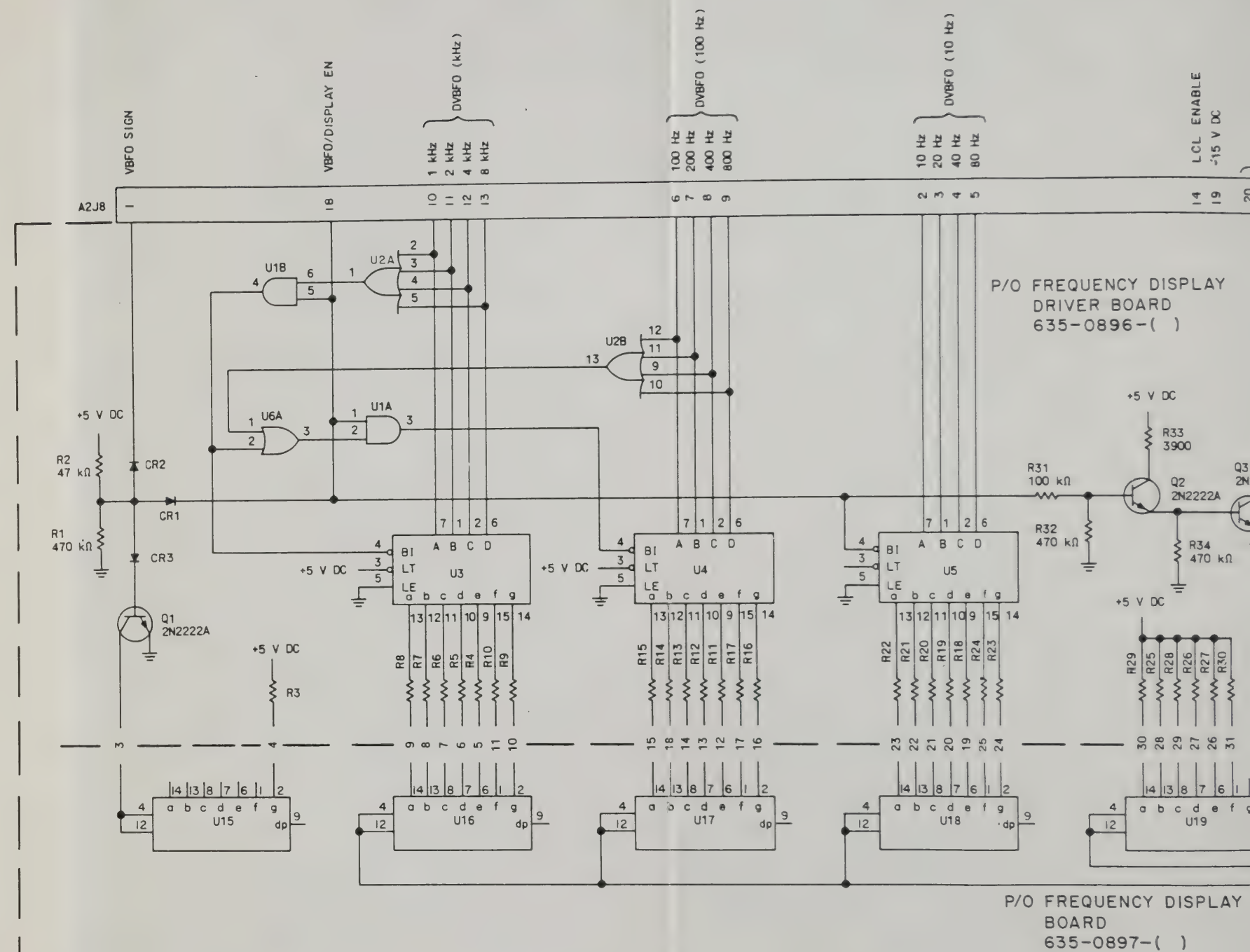
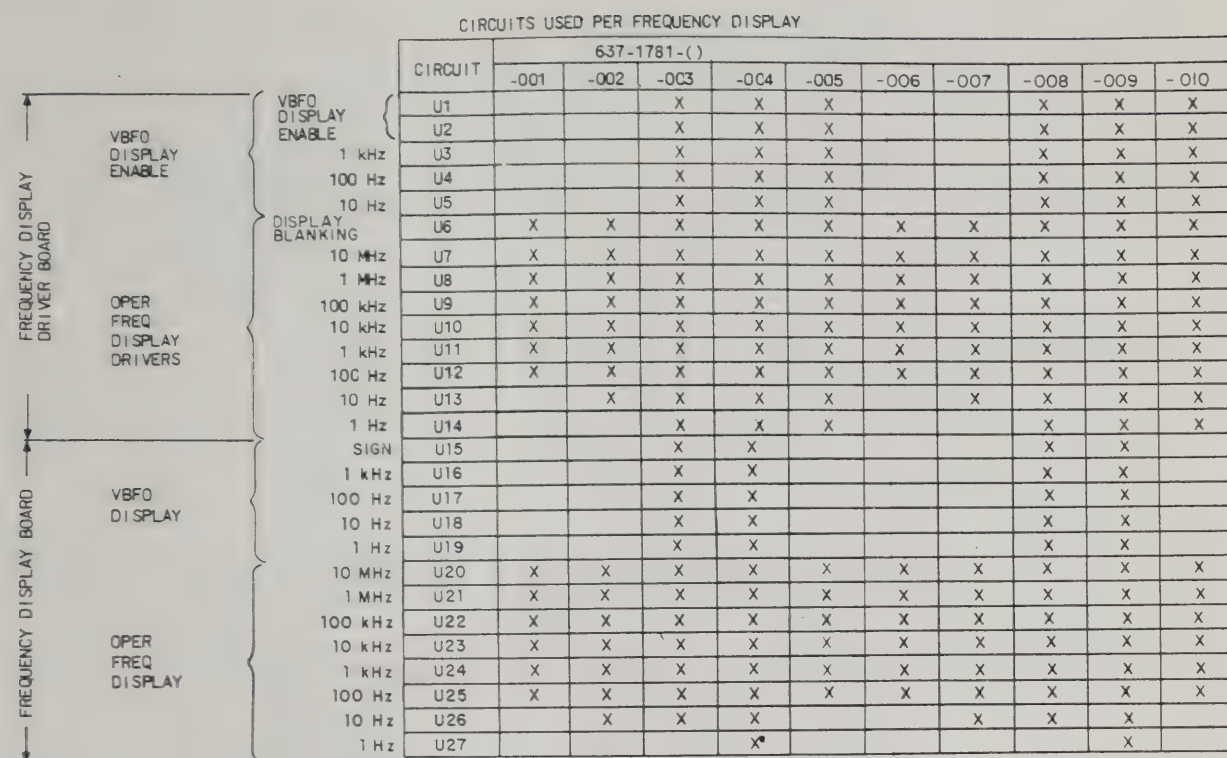


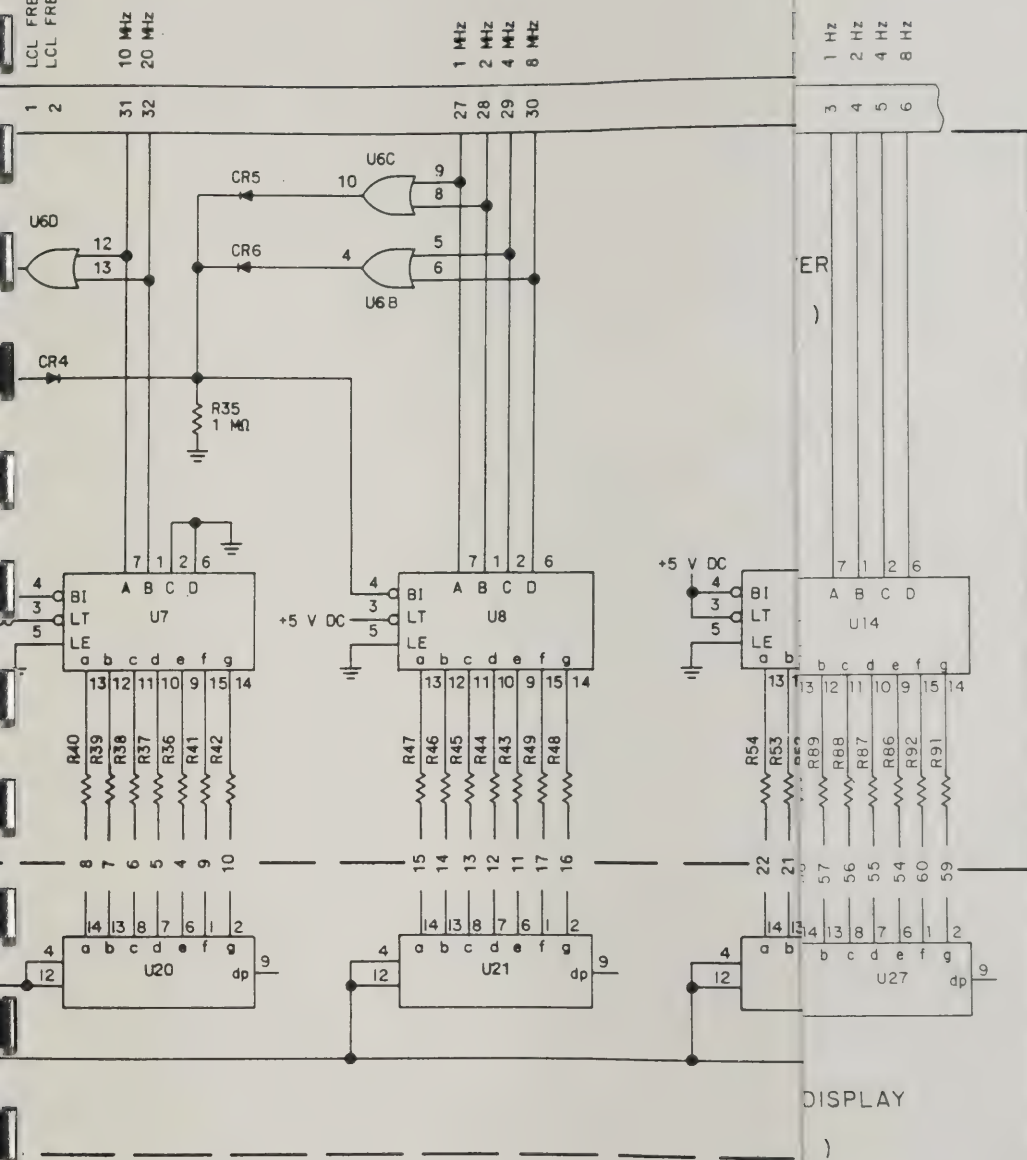


CIRCUITS USED PER

CIRCUIT	637	
	-001	-002
U1		
U2		
U3		
U4		
U5		
U6	X	X
U7	X	X
U8	X	X
U9	X	X
U10	X	X
U11	X	X
U12	X	X
U13		X
U14		
U15		
U16		
U17		
U18		
U19		
U20	X	X
U21	X	X
U22	X	X
U23	X	X
U24	X	X
U25	X	X
U26		X
U27		





LCL FREQ. ENABLE
LCL FREQ. CHANGE

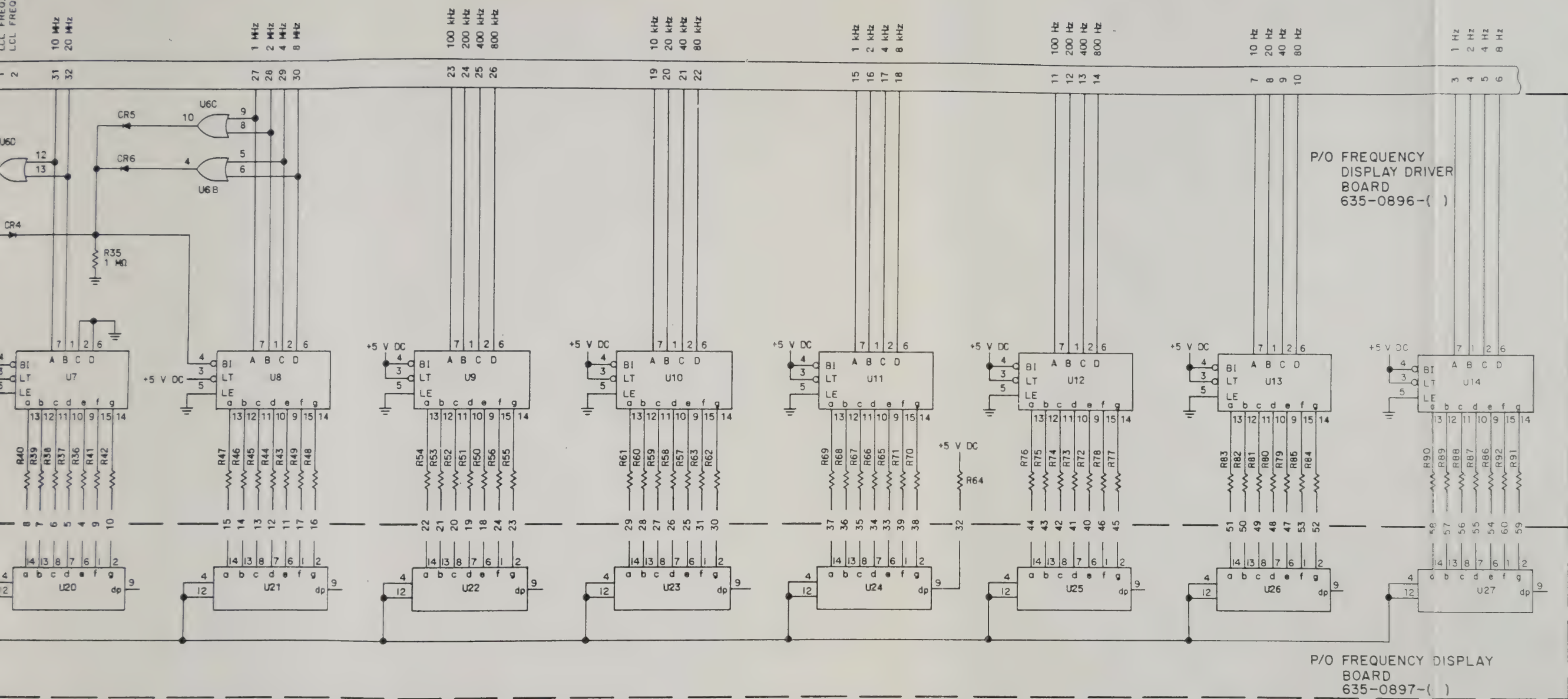
NOTES:

- ① RESISTORS R3 THRU R30 AND R36 THRU R92 ARE 180 OHM.
- ② DIODES ARE TYPE 1N4454.

TPA-0277-025

Frequency Display, Schematic Diagram
Figure 3 (Sheet 4)

LCL FREQ. CHANGE
LCL FREQ. CHANGE



RES:

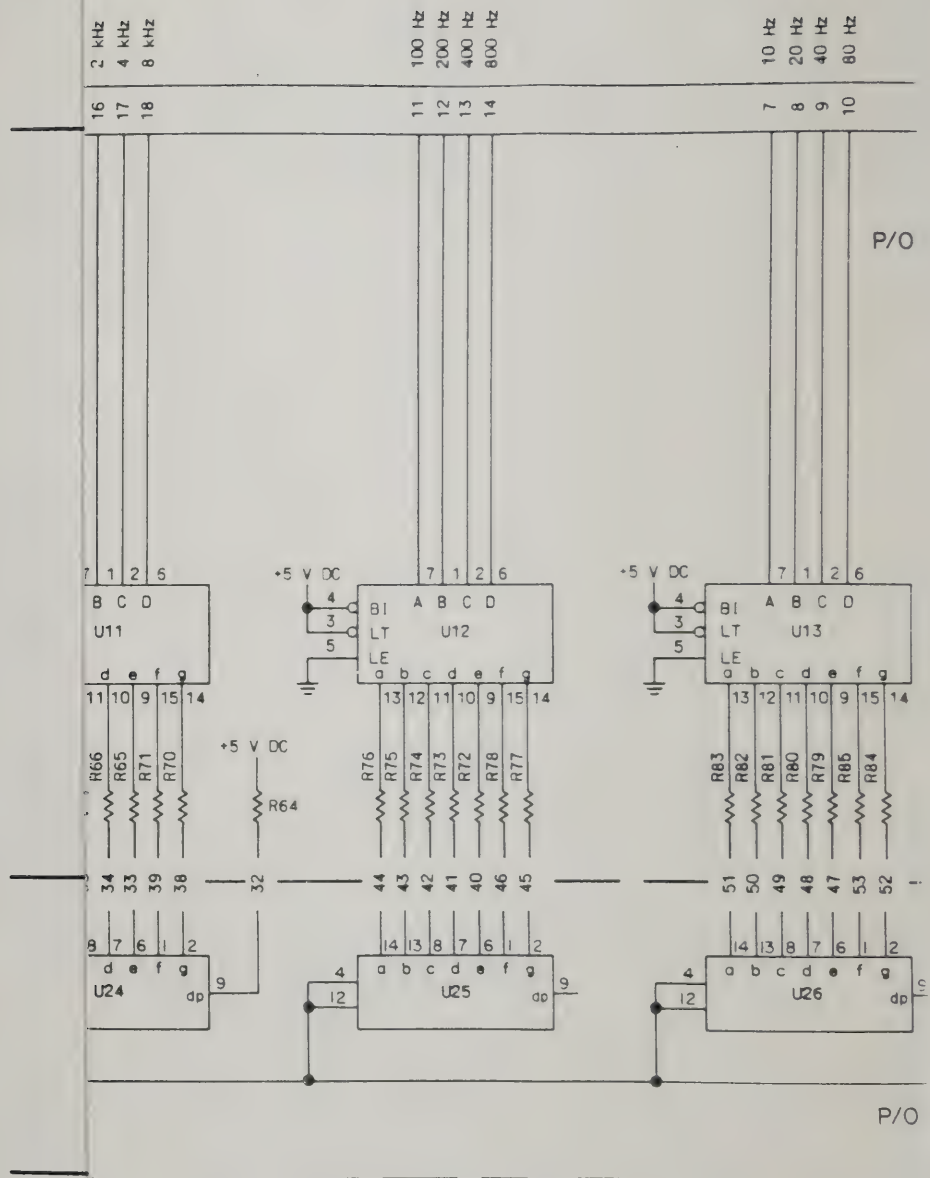
RESISTORS R3 THRU R30 AND R36 THRU R92 ARE 180 OHM.

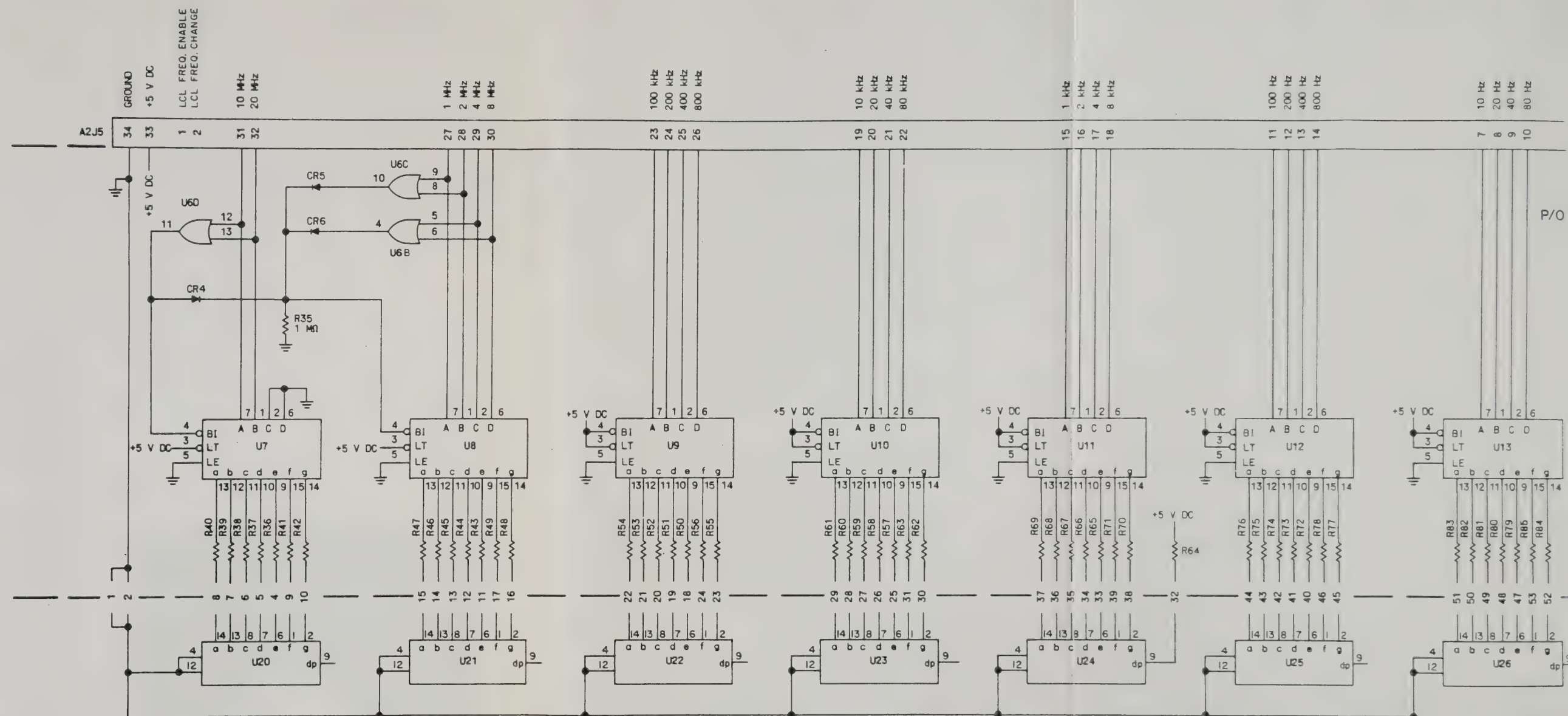
DIODES ARE TYPE 1N4454.

3 POWER AND GROUND CONNECTIONS

U NO.	TYPE	POWER (V DC)	
		+5	GND
U1	MC14081BCP	14	7
U2	MC14072BCP	14	7
U3, U4, U5, AND U7 THRU U14	MC14511BCP	16	8
U6	MC14071BCP	14	7
U15 THRU U27	MAN3640A		

Frequency Display, Schematic Diagram
Figure 3 (Sheet 4)



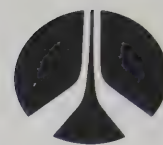


NOTES:

- ① RESISTORS R3 THRU R30 AND R36 THRU R92 ARE 180 OHM.
- ② DIODES ARE TYPE 1N4454.

③ POWER AND GROUND CONNECTIONS

U NO.	TYPE	POWER (V DC)	
		+5	GND
U1	MC14081BCP	14	7
U2	MC14072BCP	14	7
U3, U4, U5, AND U7 THRU U14	MC14511BCP	16	8
U6	MC14071BCP	14	7
U15 THRU U27	MAN3640A		



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0770519-001211

1 October 1980

AFC
(642-3224-001)

AFC

(642-3224-001)

Printed in USA

1. DESCRIPTION

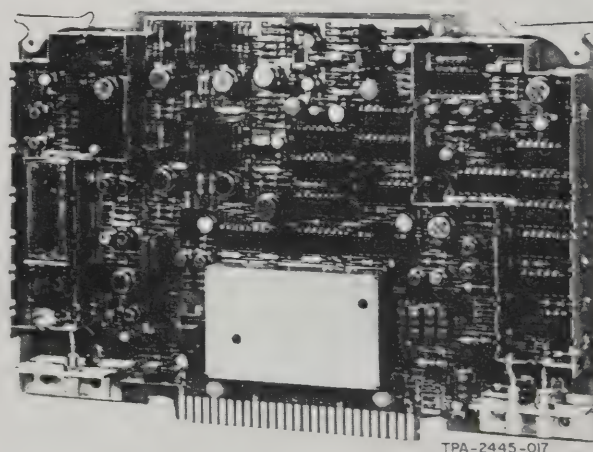
AFC 642-3224-001, figure 1, is a 2-layer planar card with a 56-pin edge-on connector (28 pins each side). This planar card has three sheet-metal assemblies that provide necessary rf isolation. The AFC card has subminiature rf connectors for connecting 450-kHz carrier input (J1), 9.9-MHz receiver injection output (J2), and 9.9-MHz reference input (J3).

The AFC card consists of a high gain if amplifier and limiter section, a quadrature phase detector, threshold type lock indicator, vcxo and switchable loop filter, 9.9-MHz pin diode switch, a 450-/455-kHz phase-locked loop, and necessary control logic circuits.

2. PRINCIPLES OF OPERATION

2.1 General

The following paragraphs describe how the AFC card accepts a low level received carrier signal, compares its phase relationship to a standard 9.9-MHz reference and corrects the phase of the received signal to maintain phase coherence over a wide range of signal levels and phase variations. The AFC card uses the AFC enable signal and a varying signal proportional to the phase difference between the received signal and a 9.9-MHz reference to automatically vary AFC signal bandwidth and the output control voltage of a switchable loop filter. The control voltage is applied to a voltage-controlled crystal oscillator (vcxo) to maintain phase coherence with the incoming received signal. The vcxo output signal is routed, via the 9.9-MHz pin diode switch, to the final mixer stage of the receiver to generate the 450-/455-kHz if signal.



TPA-2445-017

AFC
Figure 1

When AFC is disabled, the pin diode switch terminates the vcxo output and applies the synthesizer generated 9.9-MHz signal to the mixer.

523-0770519-001211

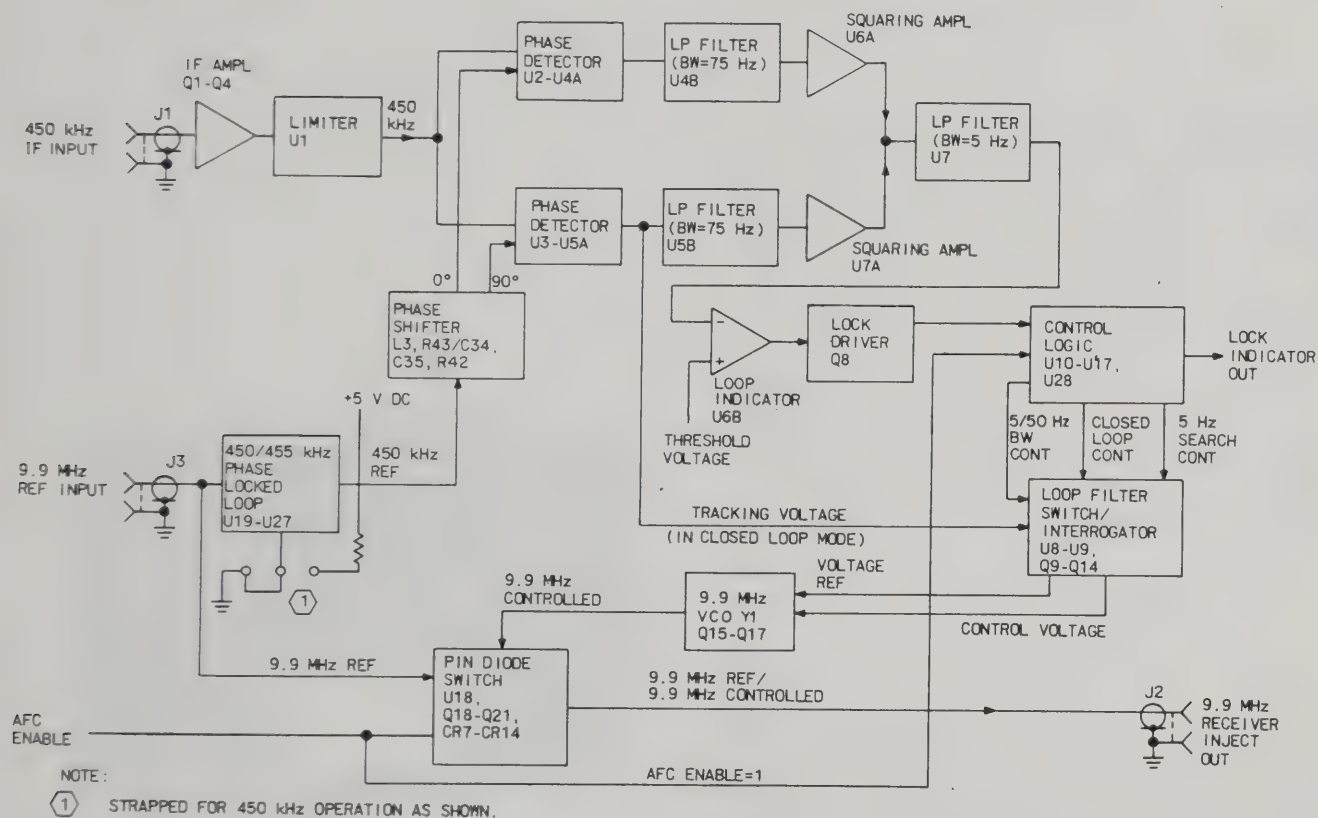
2.2 IF Amplifier and Limiter Section (Refer to figures 2 and 7)

Refer to the simplified block diagram, figure 2, and to the AFC control card schematic, figure 7, for this and future circuit descriptions.

The if amplifier stages provide signal amplification and input impedance matching. Each of the FET amplifier stages Q2 through Q4 is designed for approximately 13 dB of signal gain. Heavy dc and ac

degeneration maintain AFC signal gain almost independent of normal device parameter variation.

The crystal filter FL1 is a 4-pole monolithic design with a 250-Hz 3-dB bandwidth. The Gaussian response characteristic maintains a phase change-versus-frequency of not more than one degree per hertz to stabilize phase-locked loop (pll) operation. Skirt selectivity is the maximum obtainable consistent with the phase specification in order to provide maximum rejection of close-in interfering signals.



TPA-2602-013

AFC, Block Diagram
Figure 2

Diodes CR1 and CR2 are configured in a back-to-back arrangement and normally do not conduct unless the amplified carrier signal becomes large enough to overdrive amplifier Q4. These diodes then provide clean, symmetrical limiting at a level sufficient to guarantee that Q4 is not overdriven and drive signal to the limiter stage U1 is constant.

The limiter integrated circuit U1 is capable of 80-dB gain at these frequencies. However, the stage is heavily loaded and voltage-limited to maintain its gain at about 43 dB. Even though the if signal is heavily limited, L2 and C21/22 constitute a resonant tank at 450/455 kHz and the amplified signal applied to the quadrature phase detectors is a constant amplitude sine wave.

2.3 Quadrature Phase Detector (Refer to figure 2)

The 450-/455-kHz reference signal from the 450-/455-kHz reference loop is applied to a passive wide-band phase-shift network consisting of L3-R43 and R42/C34/C35. The reactance of L3 at 450 kHz is chosen to be approximately equal to the magnitude of R43 resulting in a +45-degree shift of the signal through Q6. Similarly, the signal through Q7 undergoes a -45-degree shift due to the negative reactance of C34/C35. The net 90-degree phase difference, then, is applied to the quadrature detectors consisting of U2 and U3. Each detector output signal is proportional to the cosine of the angular difference between the 450-/455-kHz reference signal and the received carrier. Both detectors are operated in an overdriven condition to obtain a nearly triangular (rather than sinusoidal) output. This results in a nearly linear variation in output near the zero axis crossing. Low-pass filtering is accomplished at the detector outputs to remove the remaining residual if signal. The differential output is converted to single-ended in amplifiers U4A and U5A.

Active low-pass filters consisting of operational amplifiers U4B and U5B were incorporated for purposes of providing additional rejection of interfering close-in signals. The AFC control is most often used to acquire and track SSB and DSB signals with carrier suppression up to 20 dB. If the incoming suppressed carrier signal is moderately weak, the residual carrier to which the AFC must acquire and track is reduced yet another 20 dB and may actually be below the ambient noise level. The phase detectors respond to the angular difference between the reference and received signals as we noted earlier. Even during a locked condition, a low amplitude undesired signal

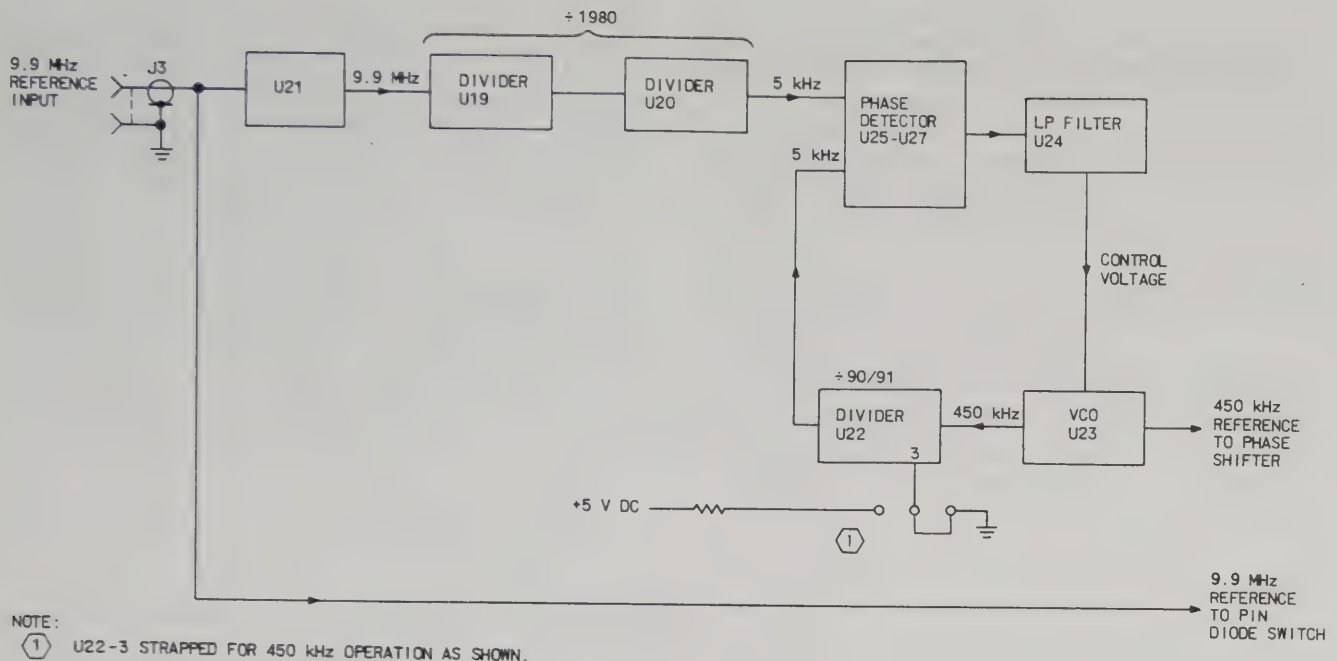
presented to the phase detectors will result in modulation of the detector output which will ultimately modulate the 9.9-MHz vxo. As interfering signal levels rise, the difference frequency appearing at the phase detector outputs can actually drive the vxo sufficiently to cause the loop to lose lock. This happens when the peak excursion of the phase detectors is large enough to correspond to an instantaneous phase difference between the carrier and reference vectors of approximately 90 degrees. Consequently, large amounts of rejection are required to maintain a satisfactory lock in the presence of large close-in signals. The active low-pass stages provide additional protection outside of their 75-Hz bandwidth.

2.4 450/455 kHz Phase-Locked Loop (Refer to figure 3)

The 9.9-MHz reference input at J3 is fed to the 9.9-MHz pin diode switch (to be discussed later), and to the 450-kHz phase-locked loop. This 9.9-MHz reference is fed through U21 to a divide-by-1980 network consisting of U19 and U20. The 5-kHz output from U20 is fed into the phase detector (U25-U27). The second 5-kHz input to the phase detector comes from the 450-kHz vco (U23), and is fed into the divide-by-90/91 section (U22). The output of the low-pass loop filter (U24) drives the vco in a direction such that the divided output of U22 is 5 kHz and at a constant phase with the reference. In the case shown, the division ratio is 90 and vco frequency is 450 kHz. When the division ratio is changed (by changing the strapping) to 91, the vco frequency is automatically adjusted to 455 kHz to maintain the same 5-kHz phase detector input frequency. This signal is in phase lock with the reference signal. Two outputs from the vco are utilized; one provides a signal to the divider stage (U22) and the other is filtered to obtain a sine-wave reference for phase shifter use.

2.5 Threshold Type Lock Indicator (Refer to figures 2 and 7)

Squaring amplifiers, whose output is proportional to the total energy in each channel, are summed and weighted before application to the 5-Hz low-pass filter stage, U7B. The output drives a comparator U6B which incorporates positive feedback thereby providing some hysteresis following loop lock to prevent momentary loss of lock on weak signals. The lock indicator automatically switches loop bandwidths following carrier acquisition, enables certain inhibit functions in control logic, switches the loop to a stable tracking mode after signal acquisition and provides a



TPA-2603-013

450-/455-kHz Phase-Locked Loop, Simplified Block Diagram
Figure 3

visible indication to the radio operator of lock status via the front-panel lock indicator light.

Operation of the lock indicators is predicated upon a weighting of the I and Q channels according to

$$g(V) = \alpha a - b$$

where a and b represent the I and Q outputs and α is the weighting function. From a statistical point of view, the weighting function permits offsetting of the decision point superimposed on the probability density function of the combined output. This fictional point then divides the areas corresponding to probability of a valid carrier acquisition and that corresponding to a false lock indication. From this it can be deduced that these two requirements are in opposition to one another and that an improvement in one parameter is usually at the expense of the other.

A "miss probability" of 8 percent for a carrier 20 dB below pep with full-modulation signal-to-noise ratio of 12 dB in a 2800-Hz audio bandwidth corresponds to a weighting factor of 1.825. The calculated false alarm probability is 0.5 percent or 20 seconds mean-time-between-false-acquisition with the latter persisting for about 100 milliseconds on the average.

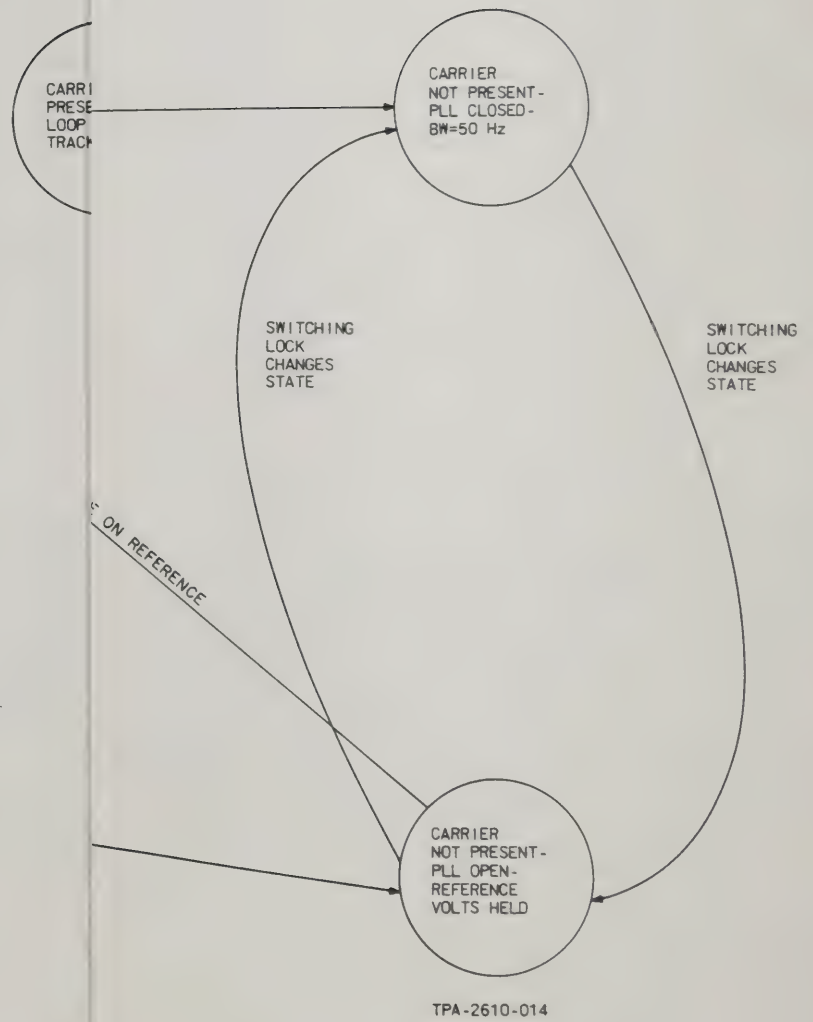
2.6 Control Logic

Control and decision logic circuits, consisting of four timers and associated gating circuitry are explained using the logic sequence diagram. (Refer to figure 4.)

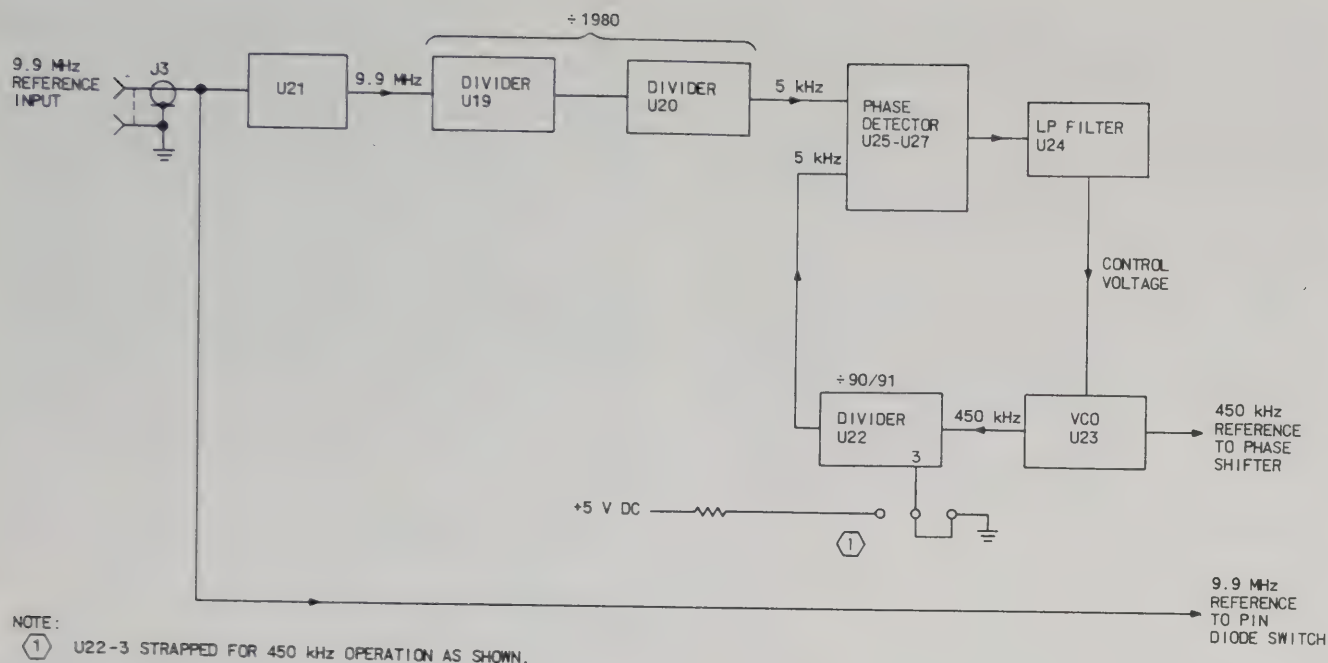
The AFC acquisition starts once the AFC is enabled. Initially, the loop bandwidth is set at 50 Hz and the 1-second timer started to allow initial conditions to be established and loop transients to settle out. During this 1-second period, if the carrier signal is present and is not facing, the loop will lock. Once the loop has locked and the 1-second timer has elapsed, the loop bandwidth is switched to 5 Hz for tracking. The AFC is now operational.

Should the AFC lose lock or the carrier signal fade or disappear, the AFC operational sequence diagram (refer to figure 4) is utilized to determine the sequence that is followed by the control and decision circuits to reacquire the carrier. The AFC reacquisition, as shown in this diagram, can be accomplished by using one of several different paths that are determined by the decision circuits and dependent upon what has transpired in the recent past.

If a signal is acquired, the direction of movement on the chart is to the left. The 1-second timer expires



AFC Operational Sequence, Block Diagram
Figure 4



TPA-2603-013

450-/455-kHz Phase-Locked Loop, Simplified Block Diagram
 Figure 3

visible indication to the radio operator of lock status via the front-panel lock indicator light.

Operation of the lock indicators is predicated upon a weighting of the I and Q channels according to

$$g(V) = \alpha a - b$$

where a and b represent the I and Q outputs and α is the weighting function. From a statistical point of view, the weighting function permits offsetting of the decision point superimposed on the probability density function of the combined output. This fictional point then divides the areas corresponding to probability of a valid carrier acquisition and that corresponding to a false lock indication. From this it can be deduced that these two requirements are in opposition to one another and that an improvement in one parameter is usually at the expense of the other.

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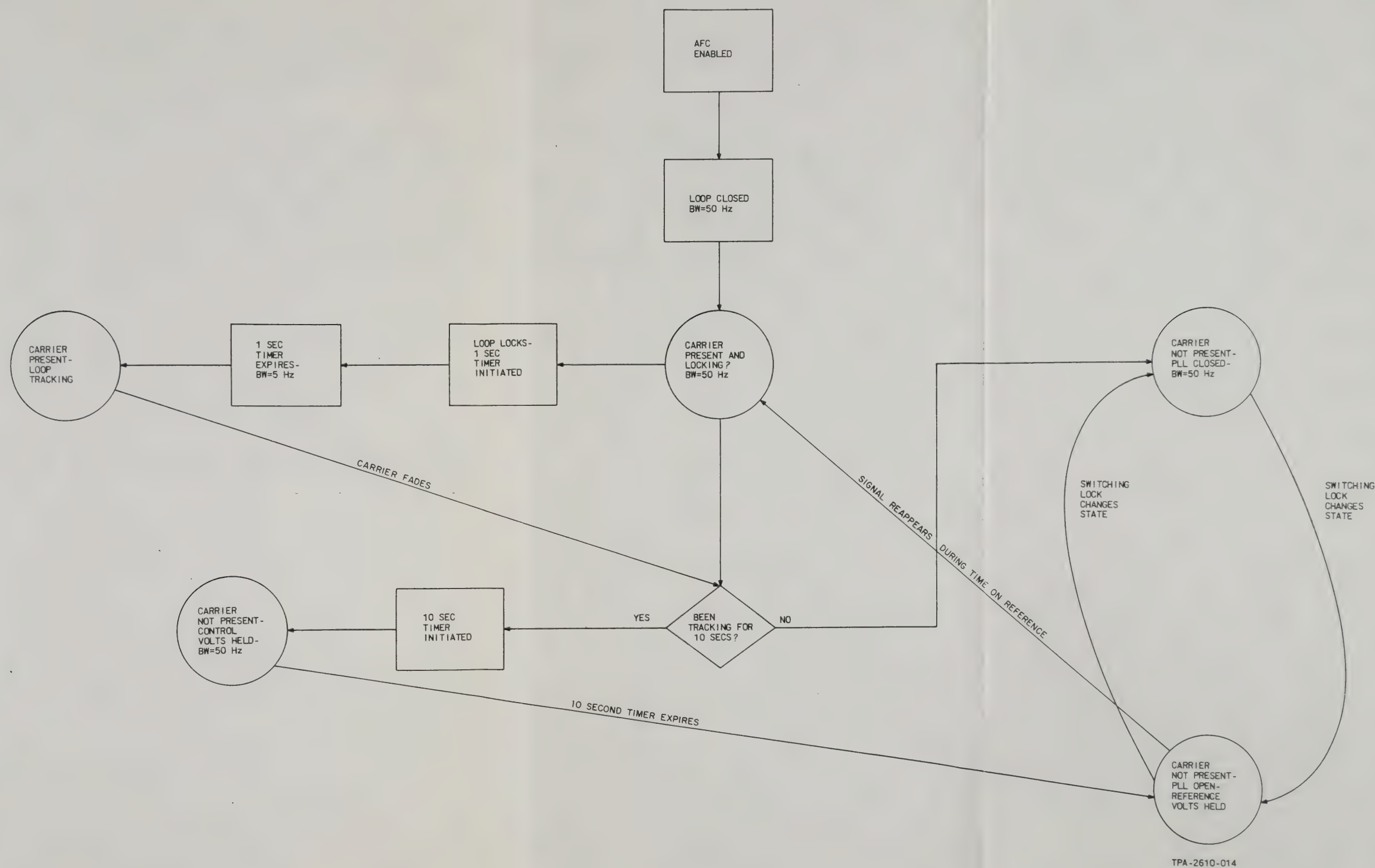
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If a signal is acquired, the direction of movement on the chart is to the left. The 1-second timer expires



TPA-2610-014

AFC Operational Sequence, Block Diagram
Figure 4

and the loop bandwidth is automatically reduced to 5 Hz for tracking purposes.

If the newly acquired carrier should fade or is suddenly lost, movement is toward a decision block that inquires if the loop had been tracking for at least 10 seconds. If the answer is "no" then the loop moves toward a "search" mode in the loop at the extreme right-hand side of the diagram which will be discussed later. In the event that the AFC control had been tracking continuously for at least 10 seconds prior to carrier loss, the most recent value of vco tracking voltage is retained forcing the control to pause for 10 seconds at the frequency where the carrier was lost. At this point, one of two things will happen; either the 10-second counter will expire and the control will initiate the search mode previously mentioned or, if the carrier reappears within ± 5 Hz of the vco tracking frequency, reacquisition will occur. Note that the loop bandwidth was automatically widened to 50 Hz at the time carrier was lost to facilitate relocking if the carrier reappears during the timeout.

If a carrier had not been present at the time that AFC was enabled, the control logic would have inquired if we had previously been tracking for at least 10 se-

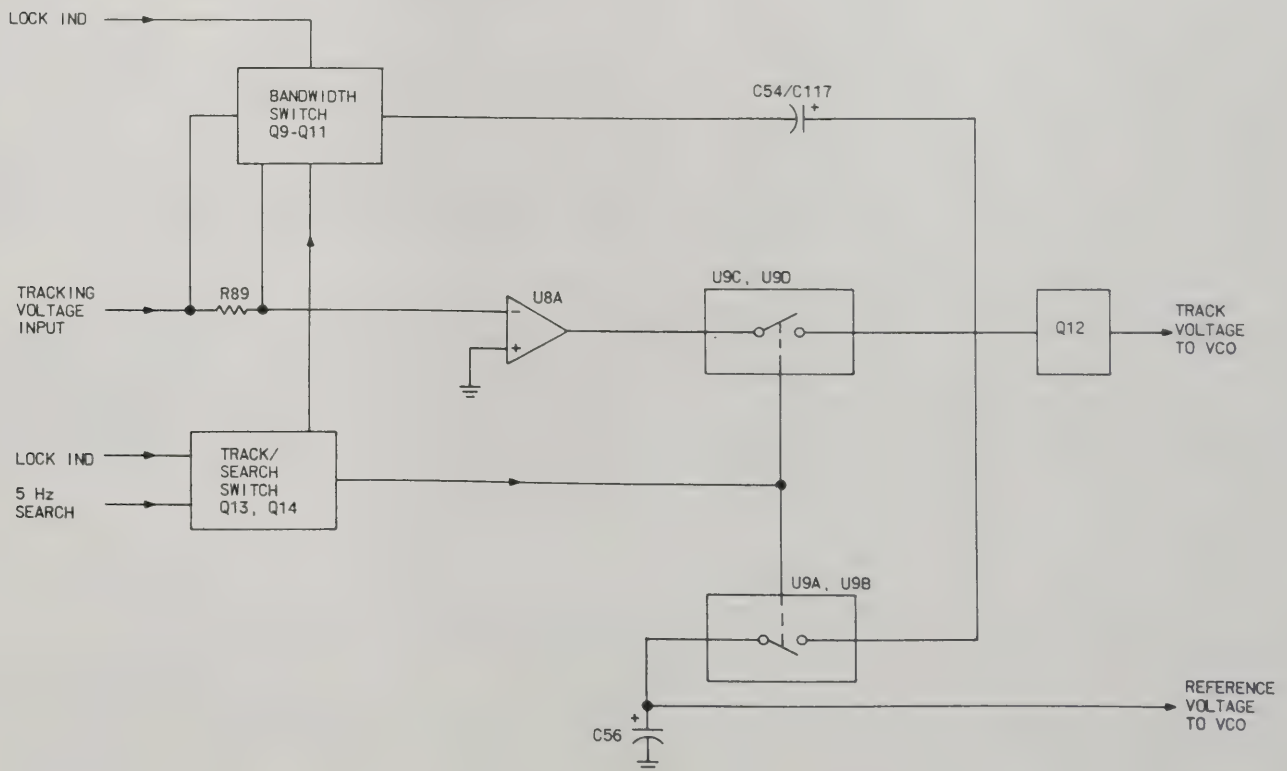
conds (decision block at the center of the diagram). Lest this seem redundant since we have only now enabled AFC, this feature permits short-term "false acquisition" due to random noise or to tuning through the carrier without enabling the HOLD function at the lower left-hand corner.

Once the decision has been made that the loop was not tracking for 10 seconds or more, the logic translates to the right-hand side of the diagram where an asymmetrical switching clock transitions between the two states shown until reacquisition occurs. This clock positions the 9.9-MHz vco on a reference voltage corresponding to 9.90000 MHz for approximately 20 percent of the switching period (a "home" position) and in the closed-loop condition for the remainder of the 5-Hz switching clock period.

This brief overview was intended to describe basic AFC control operation; a more detailed circuit description follows in succeeding sections.

2.7 Switchable Loop Filter and VCXO (Refer to figures 4 and 5)

The loop filter is used to filter the input tracking voltage through the active low-pass filter consisting



TPA-2604-013

Loop Filter Switch/Integrator, Simplified Block Diagram
Figure 5

of U8A, R89, and C54/C117. The tracking voltage is then routed through U9C, U9D (when closed), and Q12 to the vxco. At the vxco, this tracking voltage enables the vxco output to track changes of the input carrier frequency within the range of constants of the AFC loop.

The lock indicator output is used to control the bandwidth switch (Q9-Q11) by switching between 50 Hz in the open-loop (search) mode to 5 Hz in the closed-loop (track) mode. This switch (Q9-Q11) changes the input bandwidth of the loop filter by shunting resistors R88 and R90 as needed to correspond with the search and track modes.

The lock indicator and 5-Hz search inputs to the track/search switch (Q13, Q14) are used to control the operation of the analog switch U9 and Q11. Switch Q11 provides an actual ground to capacitors C54/117 during the time that the loop filter is open-looped thereby preventing noise impulses from charging or discharging loop capacitors with resultant modulation of the vxco.

The analog switch U9 has two steps, closed loop (search and track), and hold (position that U9 is shown in). During the hold position of U9 (the 10-second timer countdown), the output control voltage fed to the vxco is the tracking voltage on C54/C117. This reference voltage is used to keep the vxco at or near the last known carrier signal center frequency during the 10-second hold time to maintain receiver frequency at the point where the carrier last disappeared. In the closed-loop (track) position of switches Q13 and Q14, the U9C and U9D sections of the analog switch are closed, and the loop tracking voltage is fed to the vxco. In the open-loop (search) position of switches Q13 and Q14, the loop section (U9C, U9D) and reference voltage section (U9A, U9B) of the analog switch will switch at a 5-Hz search rate. During the search mode, analog switch U9 will be controlled by an asymmetrical 5-Hz control waveform and in the closed loop position 80 percent of the time, on the reference

voltage 20 percent of the time. This 4:1 ratio of closed-to-open-loop time of U9 increases acquisition probability. During closed-loop operation, the vxco uses the input tracking voltage to control the 9.9-MHz vxco output.

2.8 9.9-MHz Pin Diode Switch *(Refer to figure 6)*

The pin diode switch consists of T-section configurations that open and close signal paths while providing correct impedance termination of signal sources. The pin diode switch is shown responding to an AFC enable input (top), and to an AFC disable input (bottom). Figure 6 shows that with an AFC enable signal, the current path shown has CR12 cut off, thus blocking the 9.9-MHz reference signal flow to J2. With CR12 cut off, CR8 and CR9 are conducting allowing the controlled 9.9-MHz vxco signal to pass out to J2. Figure 6 shows that with an AFC disable input, the current path shown has CR8 cut off, thus blocking the controlled 9.9-MHz vxco signal flow to J2. With CR8 cut off, CR12 is conducting allowing the 9.9-MHz reference signal to pass out to J2.

3. TESTING/TROUBLESHOOTING PROCEDURES

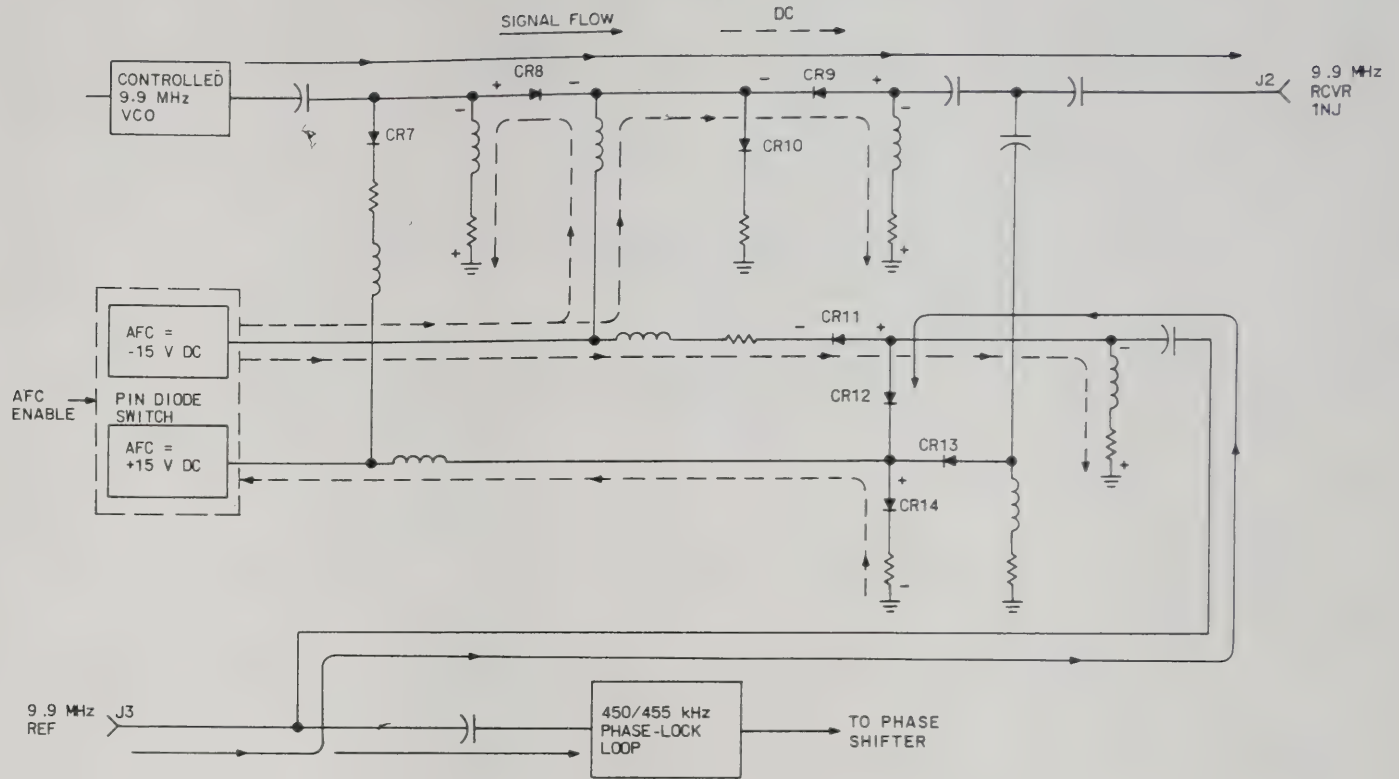
3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the AFC are listed in the maintenance section of this instruction book.

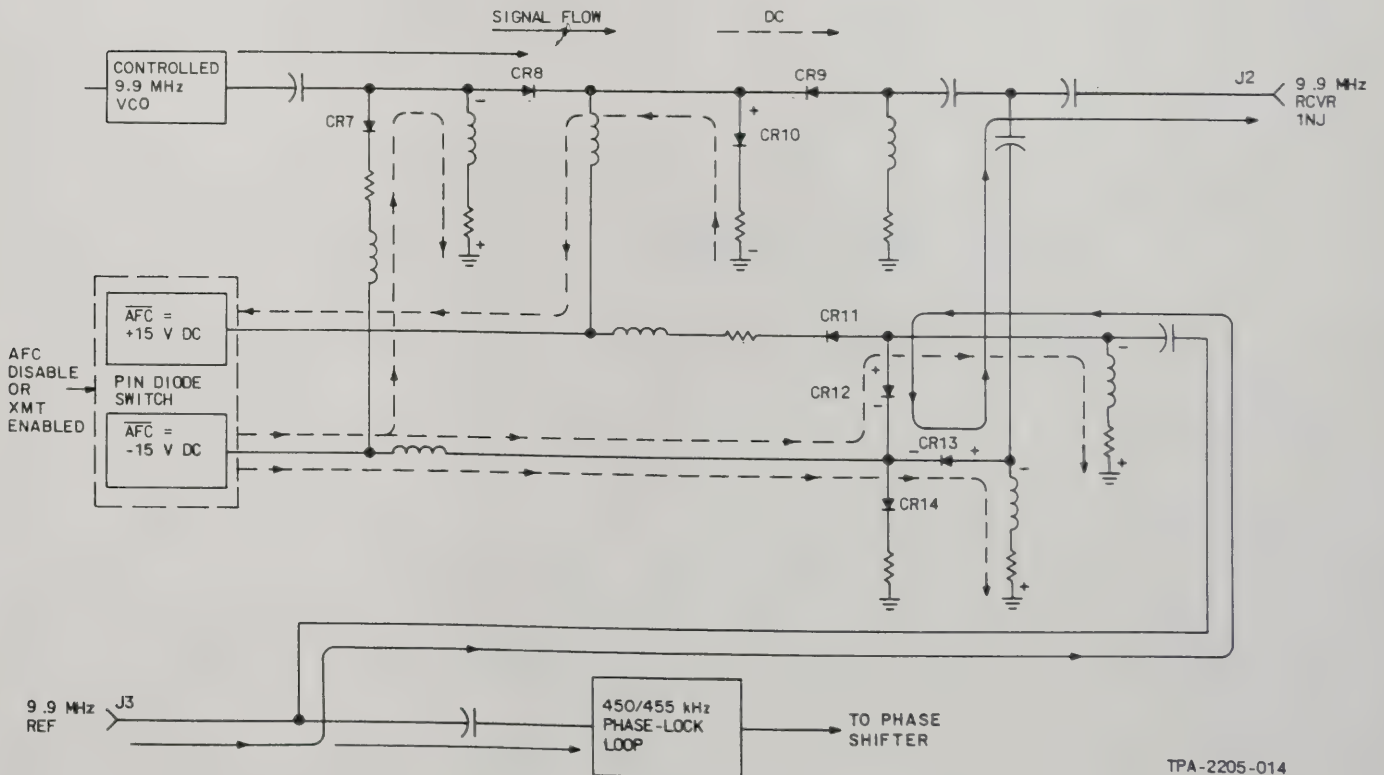
3.2 Testing

The test procedures in table 1 check total performance of the AFC control. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

AFC ON



AFC OFF/XMT ENBL



TPA-2205-014

9.9-MHz Pin Diode Switch, Flow Diagram
Figure 6

Table 1. AFC, Testing, and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Initial test setup	a. Remove the AFC card from the hf receiver. b. Insert card extender into hf receiver and insert AFC card into card extender, also insert the three coaxial cable extenders and connect them to AFC card. c. Ensure that the strapping of U22 is correct by using vom to measure the resistance of U22 pin 3 to ground. d. Set hf control power to on. e. Using a vom, measure the voltage on the following pins of P1: P1-27 P1-23 P1-10 P1-6	0 ohms +5 $\pm$ 0.25 V dc +15 $\pm$ 0.5 V dc +24 $\pm$ 1 V dc -15 $\pm$ 0.5 V dc	Check that strapping is across the two lower pins near C124 on AFC card. Check hf receiver power supply outputs.
2. If amplifier gain check	a. With the hf control set to ON, allow a warmup period. Note Allow for a 3-minute warmup once power is applied to AFC card before continuing procedures to permit the crystal oven to stabilize. b. Using a signal generator, apply an 8-MHz (-70 dB mW) input signal at RCV ANT J21. Ensure the 9.9-MHz reference signal is connected to J3. c. Using an oscilloscope, measure the peak-to-peak voltage at the junction of C23 and C38. d. Slowly decrease the 450-kHz input down to -92 while monitoring the junction of C23 and C38 on the oscilloscope.	1.0 V p-p signal at a frequency of 450 kHz. The 1.0 V p-p voltage remains constant down to about -90 dB mW.	Check Q1-Q4 and associated circuitry. (13-dB mW gain per stage). Check U1 and associated circuitry. Check Q1-Q4. Check U1 and associated circuitry.
3. 450-kHz loop operation (Cont)	a. Using an oscilloscope, check the level of signal at U21 pin 11 (on the rear of the AFC card).	TTL level at 9.9 MHz.	Check U21 and associated circuitry.

Table 1. AFC, Testing, and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	b. Using an oscilloscope, check the signal at U19 pin 12. c. Using an oscilloscope, check the signal at U20 pin 1. d. Using an oscilloscope, check the signal at the right-hand side of R38 (component side of card). e. Using a vom, measure the dc voltage at the right-hand end of R161 (rear of card).	Symmetrical square wave at 990 kHz. A series of pulses of approximately 1-μs duration at a 5-kHz repetition rate. 450-kHz sine wave at approximately 0.4 to 0.5 V p-p amplitude. Approximately +5 to 6.5 V dc.	Replace U19. Replace U20. Check U22-U27 and associated circuitry. Change the value of C112 until voltage falls within level stated in normal indication column with frequency at 450 kHz ± 1 Hz.
4. Phase detector check	a. Connect an oscilloscope (with dual trace) channel A probe to U4 pin 1 and channel B probe to U5 pin 1; using dual trace, monitor both channels. b. Increase the input frequency at J1 to 450.005 Hz. c. Set the input frequency at J1 to 450 kHz.	4.0 V p-p signals at U4 pin 1 and U5 pin 1 that are 90° out of phase with each other.	Check U2-U5 and associated circuitry.
5. Loop signal acquisition	a. Monitoring the signal at U4 pin 1 using an oscilloscope, set the AFC ON/OFF switch to ON. b. After 15 seconds, while monitoring U14 pin 1, remove input signal at J1. c. Replace input signal at J1. Reduce input signal level at J1 to -106 dB mW. Switch the AFC ON/OFF switch several times between ON and OFF.	Signal goes to approximately 0 V dc and the difference signal has disappeared. The lock indicator on control is lit. Switches to logic 1 (+3 to +5 V dc) for 10 seconds, then switches to logic 0 (0.0 to +2 V dc). The loop retains its lock condition.	Refer to paragraph 4 and readjust R105. Check U15 and associated circuitry. Check U6 and control logic circuitry. Check U8 and associated circuitry. Check C56.
(Cont)			

Table 1. AFC, Testing, and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	d. Using an oscilloscope set on dual trace, with channel A probe monitor P1-16 and with channel B probe monitor P1-2, remove the input at J1. e. Reapply the 450-kHz input to J1 while monitoring P1-16 and P1-2 on dual trace oscilloscope. f. Disable the AFC ON/OFF switch on the control and remove 450-kHz input at J1. g. Replace the 450-kHz input at J1 and offset this input frequency 50 Hz above or below 450 kHz. While this input is offset, set the AFC ON/OFF switch to ON. h. Slowly vary the input at J1, with the AFC ON/OFF switch set to ON, above and below 450-kHz input until a deviation of 1000 Hz is realized. i. While monitoring P1-20 with an oscilloscope, remove input to J1.	The channel A signal drops to logic 0 immediately, 10 seconds later the channel B signal drops to logic 0 and the lock indicator light on the control goes out. Both signals return to logic 1 and lock indicator lights. Lock indicator light on the control goes out. The lock indicator should light within 1 second after AFC is enabled (an average time of 10 tries). The lock indicator remains lit during variations not exceeding a 10-Hz per second rate. After 10 seconds signal switches between a logic 1 and logic 0 at a 5-Hz rate.	Check U15 and its associated circuitry. Check U16, U28, and associated circuitry. Check U8 and associated circuitry. Check U16, U15, and associated circuitry. Check U16, U15, U28, U11, U13, and associated circuitry. Check U12, U17, U10, U11, U14, and associated circuitry.
6. Hold function check	a. Set the 450-kHz input signal level at J1 for -90 dB mW and offset the 450-kHz signal 10 Hz (450 010 Hz). b. Monitor the vxco frequency at the anode of CR7 using a frequency counter. c. Set the AFC ON/OFF switch to ON and ensure a lock state for at least 15 seconds. d. Disconnect the input signal at J1 while monitoring the vxco output frequency (with frequency counter set for a 1-second sample rate).	The lock indicator is lit. The frequency counter reads 9.9 MHz. Vxco output frequency holds at 9.900 010 Hz.	Check CR15, C16, Q17, Q16, Q15, and associated circuitry. Refer to paragraph 4 and check adjustment of R172. Check C54 or C117.

4. ALIGNMENT/ADJUSTMENT

4.1 Strapping U22 for 450-kHz Operation

Refer to figure 7 and connect a shorting wire between E12 and E13 (bottom two pins next to C124) on card.

4.2 Switch Clock Adjustment (R110)

- Using an oscilloscope check for a 10-Hz frequency at the output of U12A pin 2.
- If 10 Hz is not observed, adjust R110 until 10 Hz is measured at U12A pin 2.

4.3 7.25-V dc Reference Adjustment (R95)

- Connect a high impedance voltmeter between P1 pin 5 and ground.
- Set the AFC enable/disable switch to disable.
- The high impedance voltmeter should read 7.25 ± 0.01 V dc; if not, adjust R95 until 7.25 ± 0.01 V dc is indicated on the voltmeter.

4.4 9.9-MHz VCXO Adjustment (C116)

- Ensure that power has been applied to the AFC control for more than 3 minutes (crystal oven warmup time) before making this adjustment.
- Using a frequency counter, measure the frequency at the anode of CR7. 9.900 000 Hz should be observed; if not, carefully adjust C116 for exactly 9.900 000 Hz.

4.5 10-Second Hold Adjustment (R105)

- Using an oscilloscope monitor the signal at U5 pin 1. This difference frequency signal and dc voltage should decrease to zero when the AFC enable/disable switch is set to enable.
- Wait for at least 15 seconds and disconnect the receive input signal.
- Then monitor U14A pin 1 with the oscilloscope. A logic 1 will appear at this point and remain for approximately 10 ± 1 seconds, then switch to a logic 0.
- If the hold time is incorrect, adjust R105 to obtain the proper duration of 10 ± 1 seconds.

4.6 Balance Adjustment (R72)

- Connect the receive input signal to J1 on the AFC control card.
- Set the receive input signal 10 Hz above 450 kHz at -90-dB mW.
- Set the AFC enable/disable switch to enable.

- After the AFC is locked on for at least 15 seconds, using an oscilloscope, observe the inband noise signal at U5A pin 1.
- With the scope dc coupled, set the inband noise signal to the center of the screen and set the scope input to 0.5 volts per centimetre.
- Remove the receive input signal, if the inband noise signal moves either side of the scope centered position before the 10-second hold period has elapsed, adjust R72 until inband noise signal remains centered for at least 10 seconds.
- Repeat steps b through f with the receive input signal set 10 Hz below 450 kHz at -90 dB mW.

4.7 VCXO 300-mV Adjustment (R113)

- Connect a rf voltmeter between the anode of CR7 and ground.
- Connect the receive input signal (450 kHz) to J1 on the AFC control card.
- Set the AFC enable/disable switch to enable.
- Once the lock indicator has been lit for more than 15 seconds, adjust R113 for a 300-mV rms output at the anode of CR7.

5. REPAIR

Repair of the AFC control is accomplished using the standard planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 7). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
00809	CROVEN LTD 500 BEECH ST WHITBY ONTARIO CANADA
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75222
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
07910	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
12020	OVENAIRE DIV OF WALTER KIDDE AND CO INC 706 FORREST ST P O BOX 1528 CHARLOTTESVILLE VA 22901
15818	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
17540	ALPHA INDUSTRIES INC 20 SYLVAN RD WOBURN MA 01801
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054
18796	ERIE TECHNOLOGICAL PRODUCTS INC STATE COLLEGE DIV 1900 W COLLEGE AVE STATE COLLEGE PA 16801

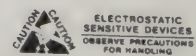
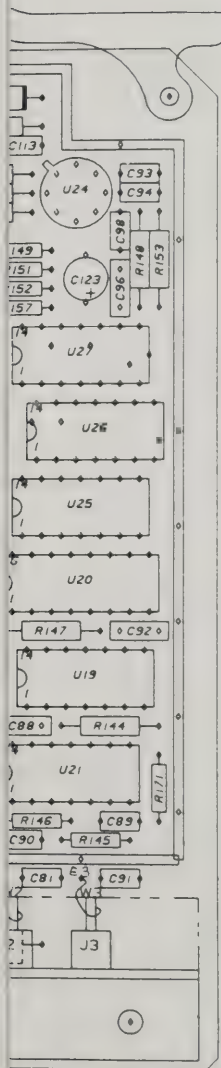
CODE	MANUFACTURER'S NAME AND ADDRESS
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20462	PREM ENTERPRISES INC 3519 N CHAPEL HILL MC HENRY IL 60050
25088	SIEMENS CORP 186 WOOD AVE S ISELIN NJ 08830
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
28480	HEWLETT-PACKARD CO CORPORATE HQ 1501 PAGE MILL RD PALO ALTO CA 94304
31039	NATIONAL SCREW PRODUCTS CO INC 14401 W 11 MILE RD P O BOX 3815 OAK PARK MI 48237
34335	ADVANCED MICRO DEVICES 901 THOMPSON PL SUNNYVALE CA 94086
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
72982	ERIE TECHNOLOGICAL PRODUCTS INC 644 W 12TH ST ERIE PA 16512
80294	BOURNS INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
91293	JOHANSON MFG CO P O BOX 329 BOONTON NJ 07005
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
AFC	642-3224-001	REV C



TPA-2269-014

AFC, Schematic Diagram
Figure 7 (Sheet 1 of 6)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	AFC (ESDS)	642-3224-001					
CR1,CR2	SEMICONV DEVICE	353-3644-050		03508	77-000		81349 RCR07G100KS
CR3	SEMICONV DEVICE (ESDS)	353-3691-010		28480	15-530		81349 RN5501302F
CR4	SEMICONV DEVICE	353-3644-010		03508	81-000		81349 RCR07G470KS
CR5	SEMICONV DEVICE (ESDS)	353-3691-010		28480	18-000		81349 RN5502871F
CR6	SEMICONV DEVICE	353-3644-010		03508	14-000		81349 RN5501622F
CR7-CR14	SEMICONV DEVICE	922-6119-010		28480	16-000		81349 RN5501102F
CR15	SEMICONV DEVICE	922-6131-010		25008	15-720		81349 RN5503242F
CR16	SEMICONV DEVICE	922-6139-020		17540	15-000		81349 RN5502742F
C1	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	10-000		81349 RN5502152F
C2	CAPACITOR,FXD CER DIEL, 3300PF, PORM10%, 100V	913-3281-170		18796	19-000		81349 RCR07G102KS
C3-C5	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RN5502152F
C6,C7	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	14-000		81349 RCR07G472KS
C8	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RN5501002F
C9	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	14-000		81349 RN5502152F
C10	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RCR07G102KS
C11-C13	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	14-000		81349 RN5502152F
C14-C16	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RCR07G103KS
C17	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	14-000		81349 RCR07G472KS
C18	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RCR07G103KS
C19	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	14-000		81349 RN5505351F
C20	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	17-000		81349 RCR07G106KS
C21	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-250		72136	15-000		81349 RCR07G103KS
C22	CAPACITOR,FXD CER DIEL, 1500PF, PORM10%, 100V	913-3281-140		18796	11-000		81349 RN5501543F
C23,C24	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	14-000		81349 RN5501002F
C25	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	13-000		81349 RCR07G472KS
C26	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	14-000		81349 RCR07G473KS
C27-C29	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	14-000		81349 RN5501103F
C30	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	16-000		81349 RCR07G108KS
C31,C32	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	12-000		81349 RN5509091F
C33	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	14-000		81349 RN5501622F
C34	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050		72136	15-000		81349 RCR07G103KS
C35	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		72136	19-000		81349 RCR07G104KS
C36,C37	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	11-010		80294 328C41-202
C38,C39	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	16-000		81349 RCR07G562KS
C40,C41	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	19-000		81349 RCP07G472KS
C42	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RCR07G101KS
C43,C44	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	11-000		81349 RCR07G153KS
C45	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	16-000		81349 RCR07G562KS
C46,C47	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	11-000		81349 RCR07G104KS
C48-C52	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	15-000		81349 RCR07G683KS
C53	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	17-160		80294 332PH1-105
C54	CAPACITOR,FXD CER DIEL, 4.7UF, 20%, 50V	913-3279-320		16546	19-000		81349 RCR05G105KS
C55	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	12-000		81349 RCR07G394KS
C56	CAPACITOR,FXD ELCTLT, 6.8UF, 20%, 25V	184-9102-230		56289	13-000		81349 RCR07G393KS
C57	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	11-000		81349 RCR07G104KS
C58	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	17-150		80294 332PH1-504
C59	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	19-000		81349 RCR07G102KS
C60	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	16-000		81349 RCR07G393KS
C61	CAPACITOR,FXD ELCTLT, 1UF, 20%, 25V	184-9102-350		56289	17-050		80294 332PH1-201
C62,C63	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RCR07G101KS
C64	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-630		56289	15-000		81349 RCR07G123KS
C65	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	13-000		81349 RCR07G472KS
C66	CAPACITOR,FXD MICA DIEL, 56PF, 5%, 50V	912-4141-310		72136	18-000		81349 RCR07G271KS
C67,C68	CAPACITOR,FXD CER DIEL, 0.00047UF, 5%, 100V	913-3117-080		56289	18-000		81349 RCR07G362JS
C69,C70	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RCR07G101KS
C71	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	15-000		81349 RCR07G103KS
C72	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	18-000		81349 RCR07G362JS
C73	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050		72136	15-000		81349 RCR07G103KS
C74	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	18-000		81349 RCR07G362JS
C75,C76	CAPACITOR,FXD MICA DIEL, 91PF, 5%, 50V	912-4141-360		72136	15-000		81349 RCR07G133KS
C77	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	19-000		81349 RCR07G473KS
C78-C87	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	11-000		81349 RCR05G473KS
C88	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	11-000		81349 RCR07G153KS
C89-C91	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	15-000		81349 RCR07G683KS
C92	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	19-000		81349 RCR07G473KS
C93,C94	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	15-000		81349 RCR05G472KS
C95,C96	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	19-000		81349 RCR07G473KS
C97	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RCR07G472KS
C98	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	11-000		81349 RCR07G104KS
C99	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	12-000		81349 RCR07G510JS
C100	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	16-000		81349 RCR07G821KS
C101	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050		72136	12-000		81349 RCR07G510JS
C102,	CAPACITOR,FXD CER DIEL, 0.00068UF, 5%, 100V	913-3117-090		56289	18-000		81349 RCR07G510JS
C103					18-000		81349 RCR05G521KS
C104	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	16-000		81349 RCR07G821KS
C105	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	16-000		81349 RCR07G393KS
C106,	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	13-000		81349 RCR07G472KS
C107					13-000		81349 RCR05G472KS
C108	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	5-000		81349 RCR07G472KS
C109	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	5-000		81349 RCR07G103KS
C110	CAPACITOR,FXD CER DIEL, 82PF, PORM10%, 100V	913-3281-410		18796	5-000		81349 RCR05G472KS
C111	CAPACITOR,FXD CER DIEL, 0.00047UF, 5%, 100V	913-3117-080		56289	3-000		81349 RCR07G472KS
C112	CAPACITOR,FXD CER DIEL, 15PF, 5%, 75V	913-1098-180		72982	5-000		81349 RCR05G472KS
C113	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	5-000		81349 RCR07G103KS
C114,	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	5-000		81349 RCR05G472KS
C115					7-000		81349 RCR05G103KS
C116	CAPACITOR,VAR AIR DIEL, 1.0 TO 16.0PF	922-0595-070		91293	3-000		81349 RCR07G472KS
					11-000		81349 RCR07G153KS

gram

2)

PARTS LIST

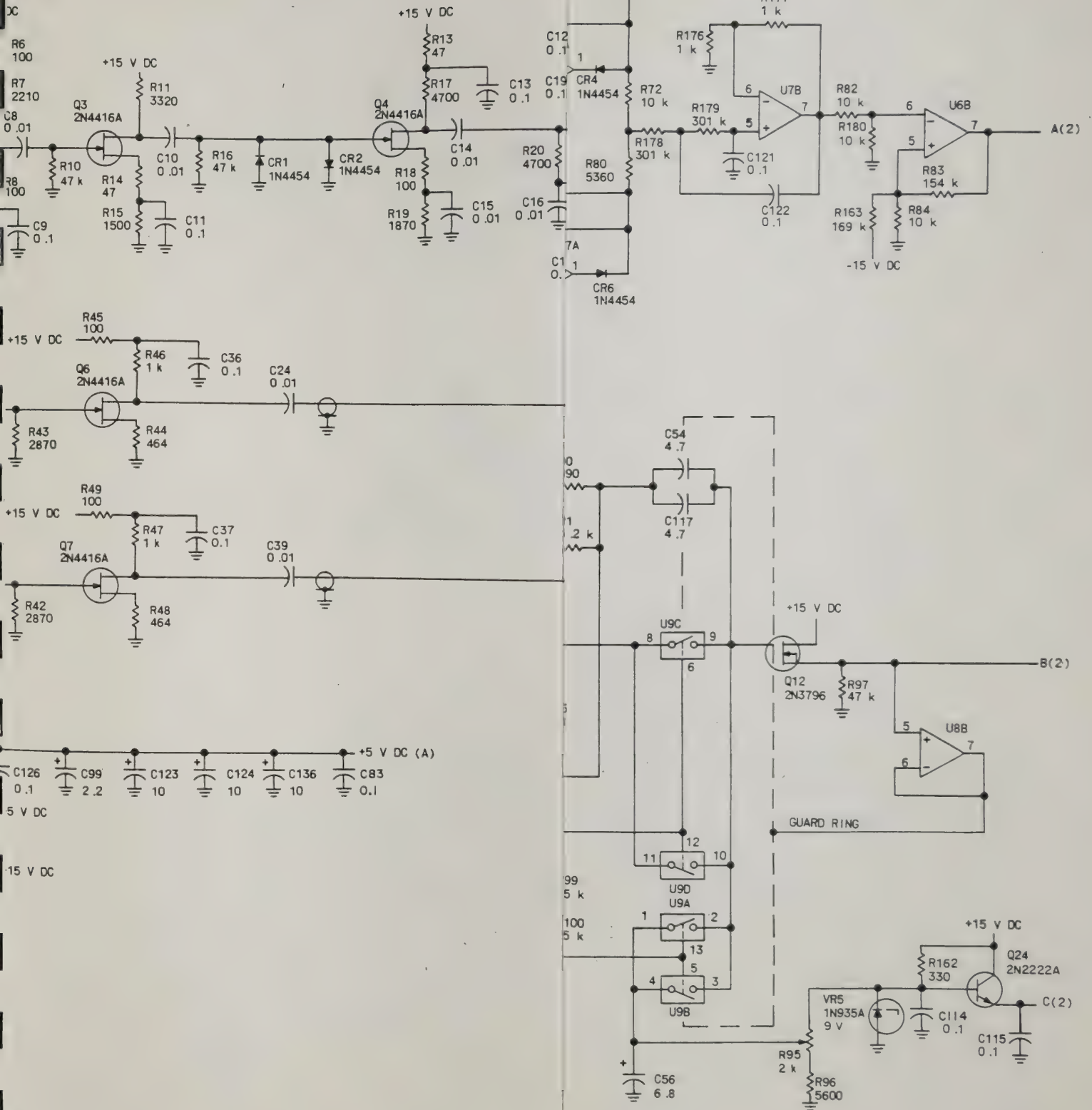
PARTS LIST (Cont)

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	AFC (ESDS)	642-3224-001			
CR1,CR2	SEMICONO DEVICE	353-3644-050		03508	1N4454A
CR3	SEMICONO DEVICE (ESDS)	353-3691-010		28480	1N5711
CR4	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
CR5	SEMICONO DEVICE (ESDS)	353-3691-010		28480	1N5711
CR6	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
CR7-CR14	SEMICONO DEVICE	922-6119-010		23480	1N5767
CR15	SEMICONO DEVICE	922-6131-010		25088	B8-109
CR16	SEMICONO DEVICE	922-6139-020		17540	DA522E
C1	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C2	CAPACITOR,FXD CER DIEL, 3300PF, PORM10%, 100V	913-3281-170		18796	8131-100C06332K
C3-C5	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C6,C7	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C8	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C9	CAPACITOR,FXD CEP DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C10	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C11-C13	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C14-C16	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C17	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C18	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C19	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C20	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990C25X0025BB1
C21	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-230		72136	DM5E470J050HV
C22	CAPACITOR,FXD CER DIEL, 1500PF, PORM10%, 100V	913-3281-140		18796	8131-100C06152K
C23,C24	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C25	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C26	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C27-C29	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C30	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C31,C32	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C33	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C34	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-030		72136	DM5F101J050HV
C35	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		72136	DM5E2200300HV
C36,C37	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C38,C39	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C40,C41	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK05BX103K
C42	CAPACITOR,FXD CEP DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C43,C44	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C45	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C46,C47	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C48-C52	CAPACITOR,FXD CEP DIEL, 0.01UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C53	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C54	CAPACITOR,FXD CER DIEL, 4.7UF, 20%, 50V	913-3279-320		16546	CY50C475M
C55	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C56	CAPACITOR,FXD ELCTLT, 6.8UF, 20%, 25V	184-9102-230		56289	199068X0025CB1
C57	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990225X0025BB1
C58	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	1990106X0020CE3
C59	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C60	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C61	CAPACITOR,FXD ELCTLT, 1UF, 20%, 25V	184-9102-350		56289	1990105X0035BB1
C62,C63	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C64	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-630		56289	19901022
C65	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C66	CAPACITOR,FXD MICA DIEL, 56PF, 5%, 50V	912-4141-310		72136	DM5E560J050HV
C67,C68	CAPACITOR,FXD CER DIEL, 0.00047UF, 5%, 100V	913-3117-080		56289	1CC03471X5100C4
C69,C70	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C71	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C72	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C73	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050		72136	DM5F101J050HV
C74	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C75,C76	CAPACITOR,FXD MICA DIEL, 91PF, 5%, 50V	912-4141-360		72136	DM5F910J050HV
C77	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C78-C87	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C88	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C89-C91	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C92	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C93,C94	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C95,C96	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C97	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C98	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C99	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990225X0025BB1
C100	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C101	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050		72136	DM5F101J050HV
C102,	CAPACITOR,FXD CER DIEL, 0.00068UF, 5%, 100V	913-3117-090		56289	2CC06681X5100C4
C103					
C104	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C105	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C106,	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C107					
C108	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990225X0025BB1
C109	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C110	CAPACITOR,FXD CER DIEL, 82PF, PORM10%, 100V	913-3281-410		18796	8121-100C06820K
C111	CAPACITOR,FXD CER DIEL, 0.00047UF, 5%, 100V	913-3117-080		56289	1CC03471X5100C4
C112	CAPACITOR,FXD CER DIEL, 15PF, 5%, 75V	913-1098-180		72982	801A075C060-150 J
C113	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C114,	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C115					
C116	CAPACITOR,VAR AIR DIEL, 1.0 TO 16.0PF	922-0595-070		91293	5453

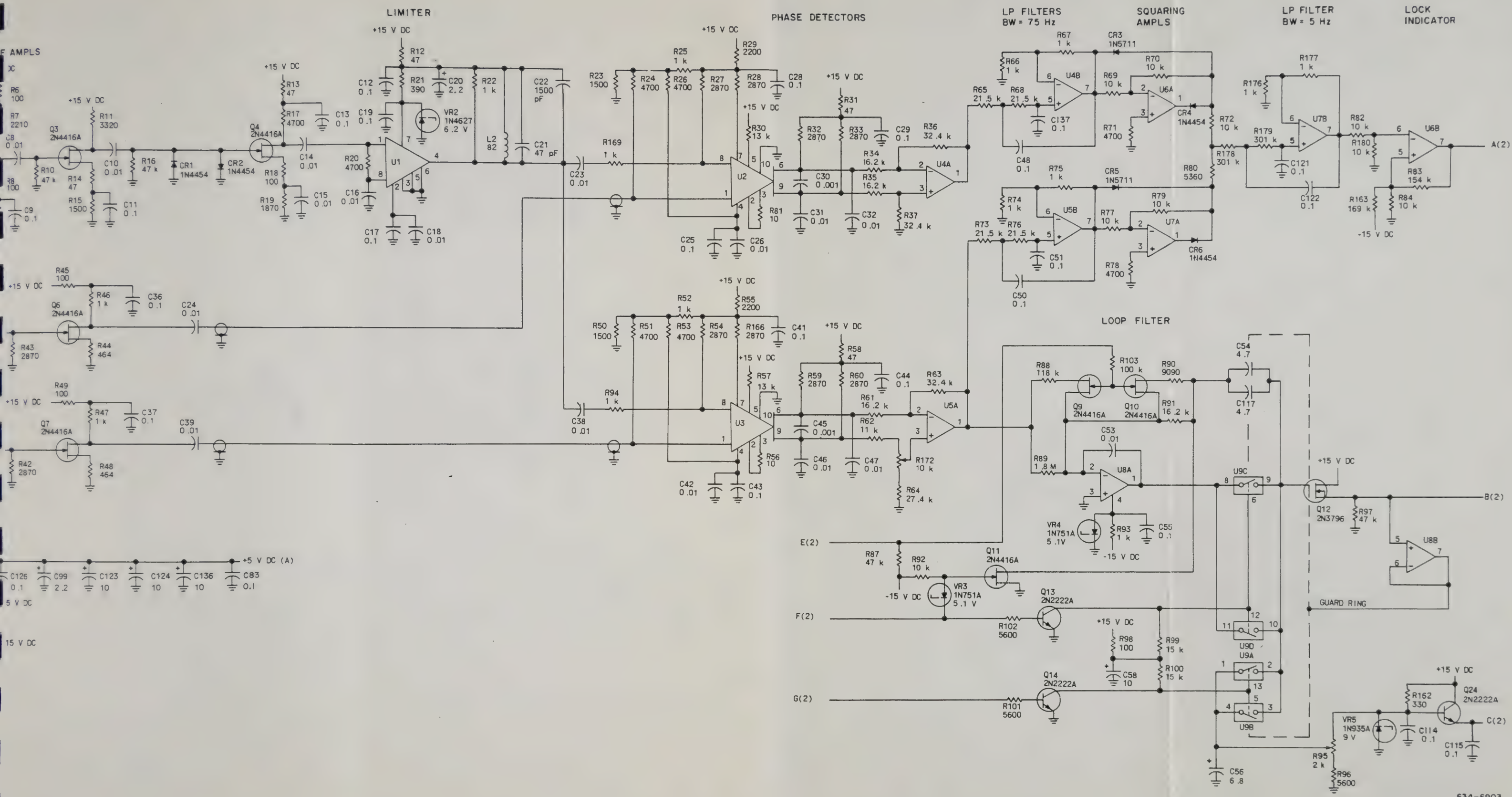
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
C117	CAPACITOR,FXD CER DIEL, 4.7UF, 20%, 50V	913-3279-320		16546	CY50C475M
C118-	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C122					
C123,	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	1990106X0020CE3
C124					
C125,	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C126					
C127,	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-630		56289	19901022
C128					
C129	CAPACITOR,FXD MICA DIEL, 18PF, PORM 0.5PF, 100V	912-4141-140		72136	DM5C1800100HV
C130,	CAPACITOR,FXD MICA DIEL, 240PF, 5%, 50V	912-4141-460		72136	DM5F241J050HV
C131					
C132	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C133	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-630		56289	19901022
C134	CAPACITOR,FXD INTLM ELCTLT, 6.8UF, 20%, 35V	184-9102-600		56289	1990565X0035DB1
C135,	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	1990106X0020CE3
C136					
FL1	FILTER,BP,XTAL	293-1339-020		00136	2B599
J1-J3	CONNECTOR,PLUG ELEC	357-7207-010		98291	52-307-3188
L1	NOT USED				
L2	COIL,RF 32UH	240-2715-360		96906	MS75089-10
L3	COIL,RF 1000UH	240-2715-490		96906	MS75089-23
L4	COIL,RF 0.56UH	240-2715-100		96906	MS75087-10
L5	COIL,RF 10UH	240-2715-250		96906	MS75088-13
L6	COIL,RF 82UH	240-2715-360		96906	MS75089-10
L7-L14	COIL,RF 68UH	240-2715-350		96906	MS75089-9
L15	COIL,RF 270UH	240-2715-420		96906	MS75089-16
L16	COIL,RF 220UH	240-2715-410		96906	MS75089-15
L17	COIL,RF 100UH	240-2715-370		96906	MS75089-11
L18	COIL,RF 1.80UH	240-2715-160		96906	MS75088-4
Q1-Q7	TRANSISTOR (ESDS)	352-0756-050		17856	2N4416A
Q8	TRANSISTOR	352-0551-010		15018	2N2907A
Q9-Q11	TRANSISTOR (ESDS)	352-0756-050		17856	2N4416A
Q12	TRANSISTOR (ESDS)	352-1018-010		04713	2N3796
Q13,Q14	TRANSISTOR	352-0661-020		07263	2N2222A
Q15-Q17	TRANSISTOR	352-0440-000		07910	2N918
Q18	TRANSISTOR	352-0661-020		07263	2N2222A
Q19	TRANSISTOR	352-0551-010		15818	2N2907A
Q20	TRANSISTOR	352-0661-020		07263	2N2222A
Q21	TRANSISTOR	352-0551-010		15818	2N2907A
Q22,Q23	TRANSISTOR	352-5501-010		04713	MP52222A
Q24	TRANSISTOR	352-0661-020		07263	2N2222A
Q25	TRANSISTOR (ESDS)	352-0605-010		04713	2N2608
R1	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR07G470KS
R2	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-300		81349	RN5501001F
R3	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R4,R5	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-300		81349	RN5501001F
R6	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R7	RESISTOR,FXD FILM, 2.21K, 1%, 1/8W	705-3605-160		81349	RN5502211F
R8	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R9	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-300		81349	RN5501001F
R10	RESISTOR,FXD CMPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G47KS
R11	RESISTOR,FXD FILM, 3.32K, 1%, 1/8W	705-1021-000		81349	RN5503321F
R12,R13	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/8W	745-2292-000		81349	RCR05G470KS
R14	RESISTOR,FXD CMPSN, 47K, 10%, 1/4W	745-0701-000		81349	RCR07G47KS
R15	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G15KS
R16	RESISTOR,FXD CMPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G47KS
R17	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G47KS
R18	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G10KS
R19	RESISTOR,FXD FILM, 1.87K, 1%, 1/8W	705-1009-000		81349	RN5501871F
R20	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G47KS
R21	RESISTOR,FXD CMPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR07G39KS
R22	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-300		81349	RN5501001F
R23	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G15KS
R24	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G47KS
R25	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR

AMPLS

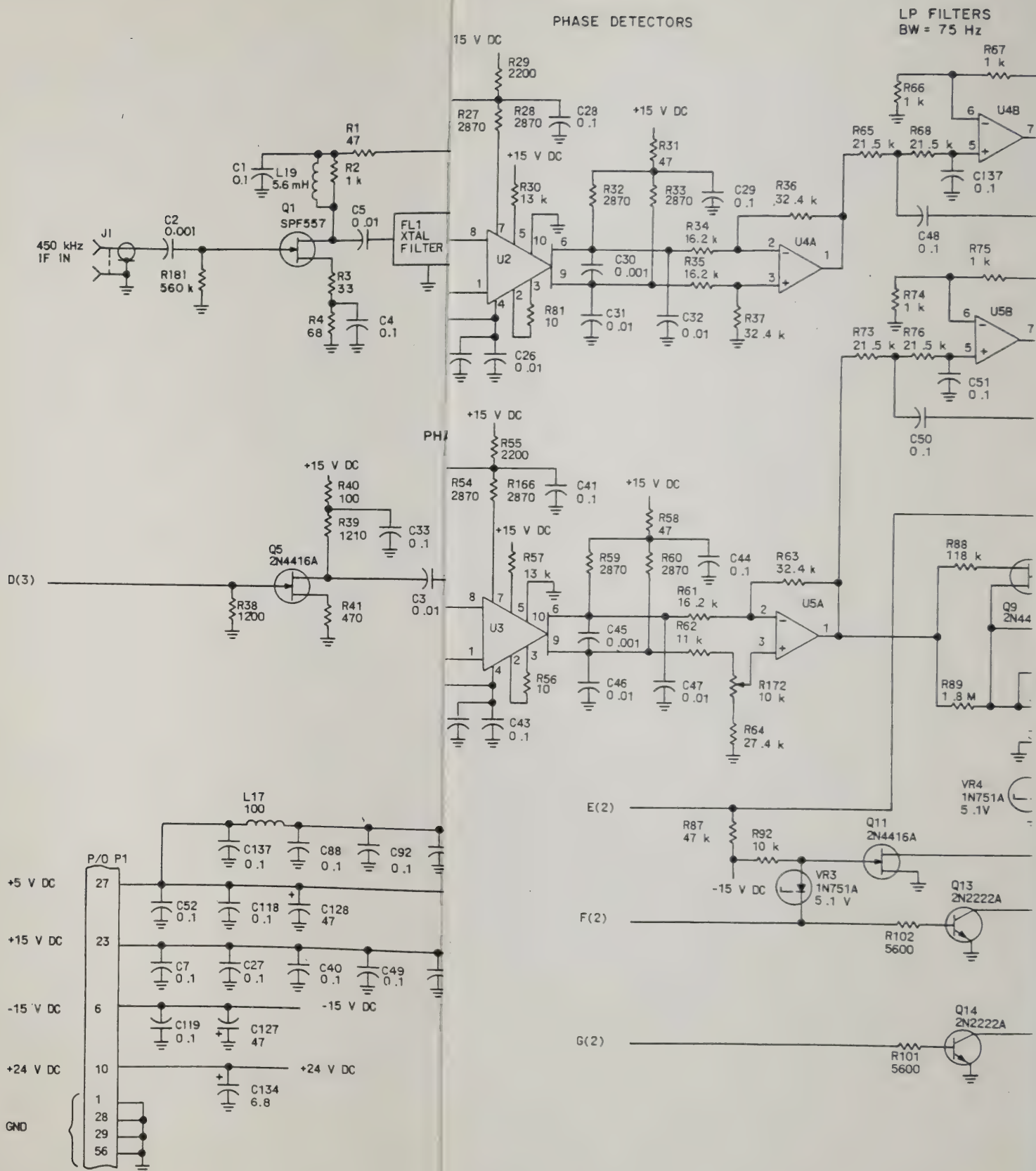


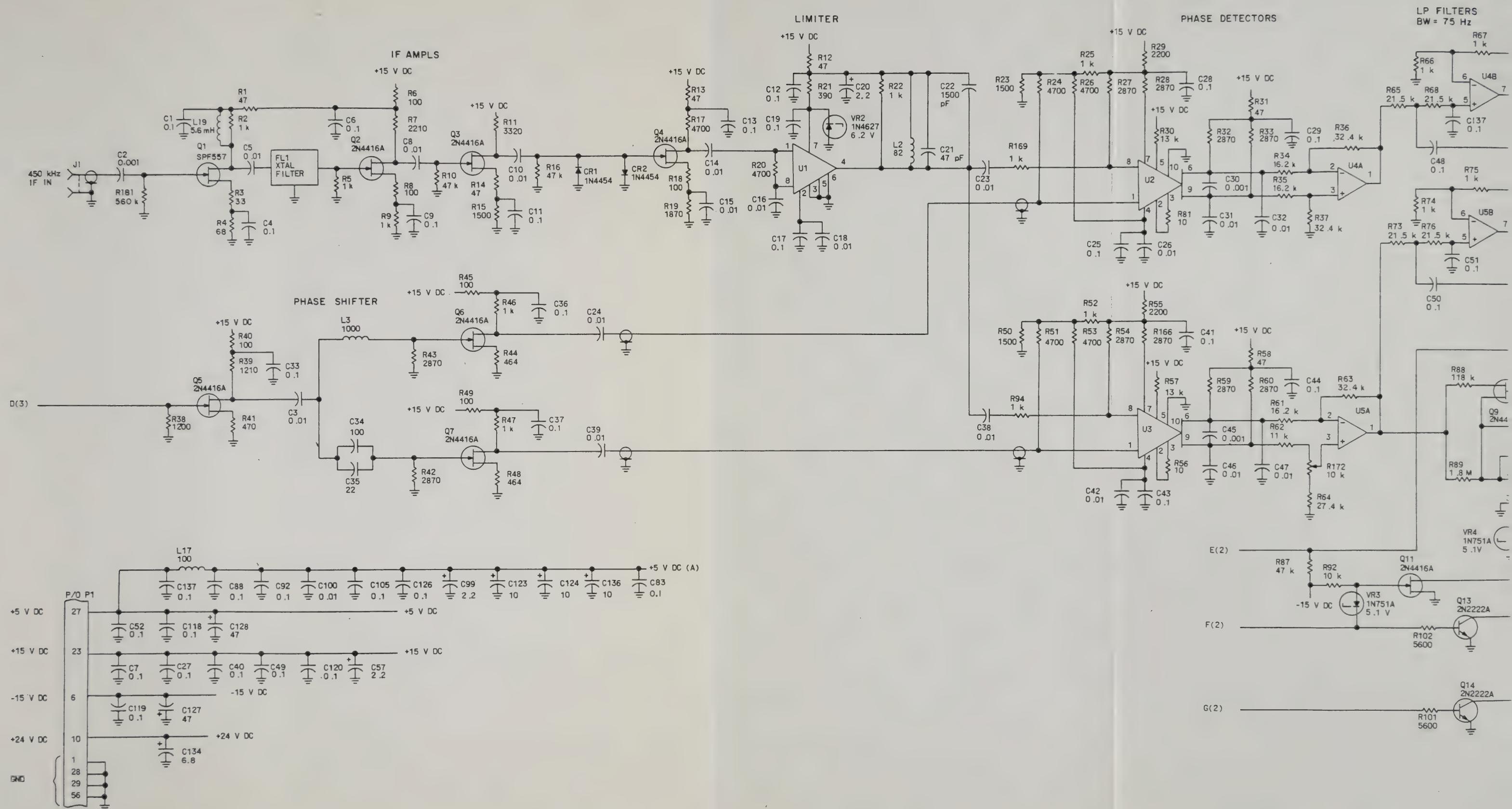
634-6903

AFC, Schematic Diagram
Figure 7 (Sheet 3)



AFC, Schematic Diagram
Figure 7 (Sheet 3)





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4)

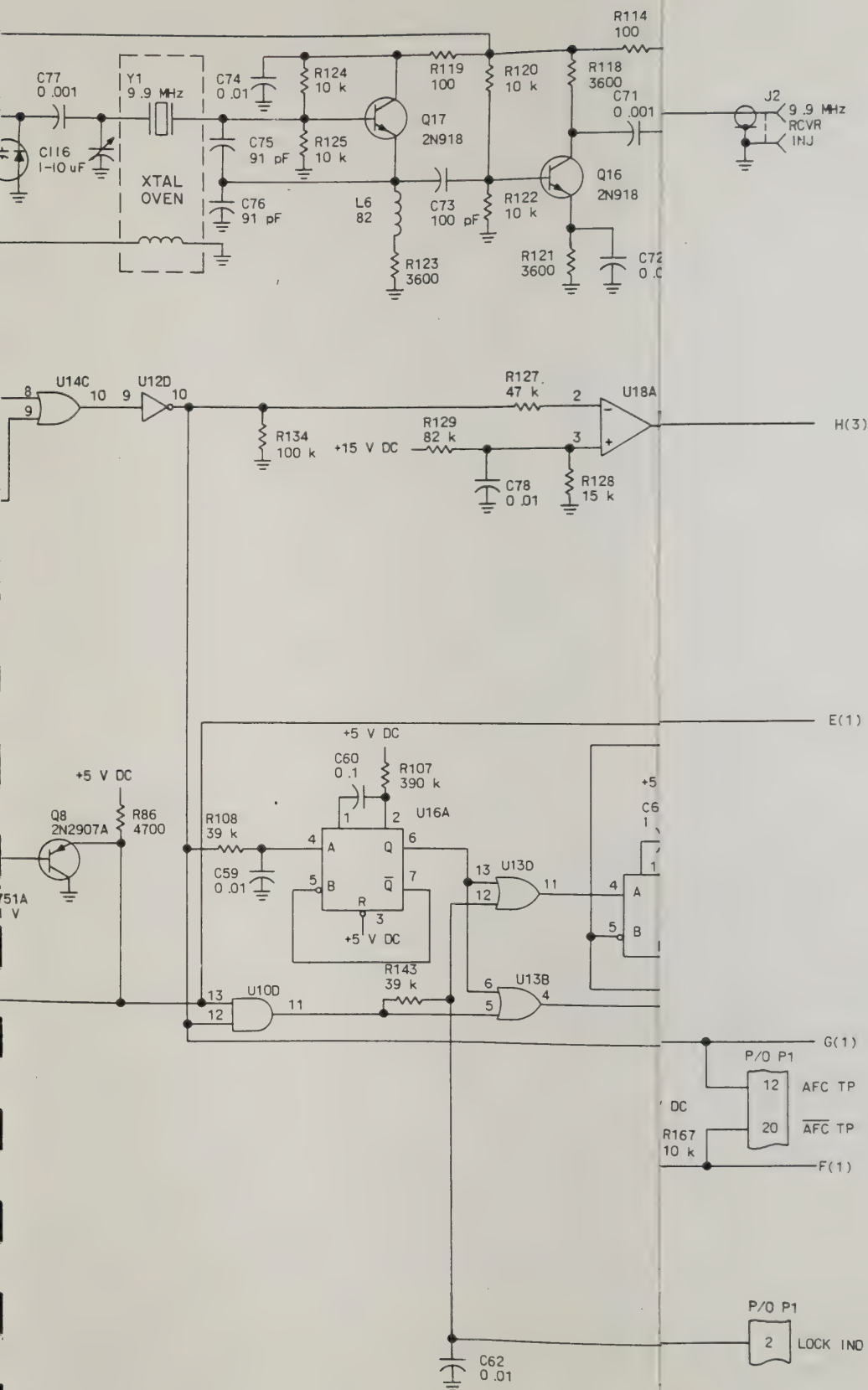
*AFC. Schematic Diagram
Figure 7 (Sheet 4)*

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
R156	RESISTOR,FXD CMPSN, 18K, 10%, 1/8W	745-2386-000		81349
R157	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		81349
R158	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349
R159	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/8W	745-2362-000		81349
R160	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		81349
R161	RESISTOR,FXD CMPSN, 18K, 10%, 1/4W	745-0794-000		81349
R162	RESISTOR,FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349
R163	RESISTOR,FXD FILM, 169K, 1%, 1/8W	705-1103-000		81349
R164	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R165	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349
R166	RESISTOR,FXD FILM, 2.87K, 1%, 1/8W	705-1018-000		81349
R167	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349
R168	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349
R169	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349
R170	RESISTOR,FXD CMPSN, 3.3MEGO, 5%, 1/8W	745-1864-370		81349
R171	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349
R172	RESISTOR,VAR 10K, 10%, 0.5W	382-0027-100		80294
R173	RESISTOR,FXD CMPSN, 39K, 10%, 1/8W	745-2398-000		81349
R174	RESISTOR,FXD CMPSN, 220K, 10%, 1/8W	745-2425-000		81349
R175	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349
R176	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-000		81349
R177				
R178	RESISTOR,FXD FILM, 301K, 1%, 1/8W	705-1115-000		81349
R179				
R180	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349
T1	TRANSFORMER,RF	278-0444-050		20462
U1	INTEGRATED CIRCUIT	351-1125-010		02735
U2,U3	INTEGRATED CIRCUIT	351-0043-010		04713
U4-U8	INTEGRATED CIRCUIT	351-1071-020		34335
U9	INTEGRATED CIRCUIT (ESDS)	351-8252-010		02735
U10	INTEGRATED CIRCUIT (ESDS)	351-8297-010		02735
U11,U12	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263
U13,U14	INTEGRATED CIRCUIT (ESDS)	351-8306-010		27014
U15,U16	INTEGRATED CIRCUIT (ESDS)	351-8479-010		04713
U17	INTEGRATED CIRCUIT (ESDS)	351-8258-010		27014
U18	INTEGRATED CIRCUIT	351-1071-020		34335
U19	INTEGRATED CIRCUIT	351-1636-010		01295
U20	INTEGRATED CIRCUIT (ESDS)	351-6882-010		04713
U21	INTEGRATED CIRCUIT	351-1523-010		27014
U22	INTEGRATED CIRCUIT (ESDS)	351-8882-010		04713
U23	INTEGRATED CIRCUIT	351-7768-010		04713
U24	INTEGRATED CIRCUIT	351-1071-020		34335
U25	INTEGRATED CIRCUIT (ESDS)	351-8160-080		31039
U26	INTEGRATED CIRCUIT (ESDS)	351-6184-020		04713
U27	INTEGRATED CIRCUIT (ESDS)	351-8183-030		07263
U28	INTEGRATED CIRCUIT (ESDS)	351-8160-030		31039
VR1	SEMICONV DEVICE	353-2710-000		07263
VR2	SEMICONV DEVICE	353-3591-510		04713
VR3,VR4	SEMICONV DEVICE	353-2710-000		07263
VR5	SEMICONV DEVICE	353-3157-000		81483
XY1	OVEN,XTAL	292-0329-050		12020
Y1	CRYSTAL UNIT,QTZ 9.900000MHZ	289-7157-080		00809

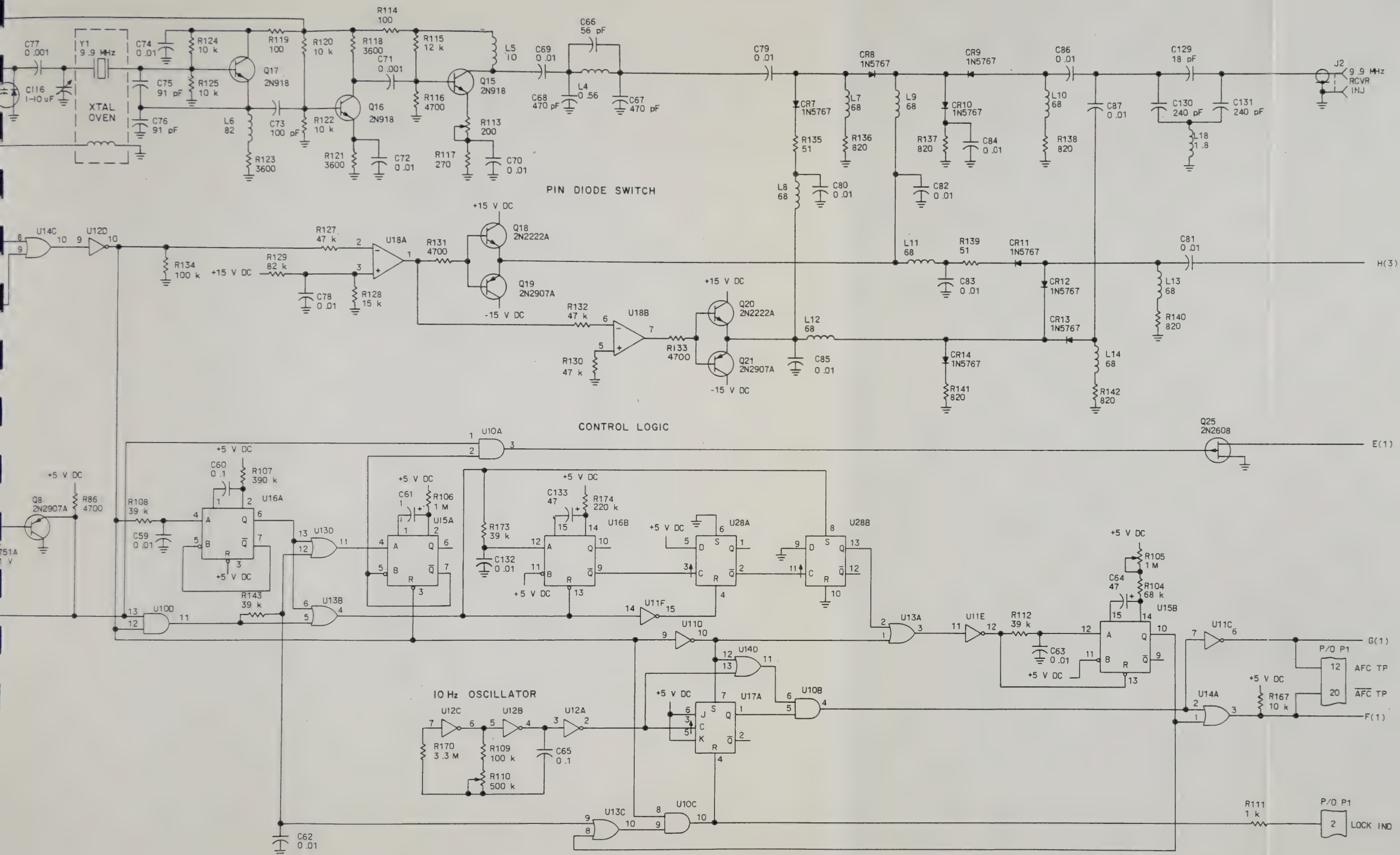
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R156	RESISTOR,FXD CMPSN, 18K, 10%, 1/8W	745-2386-000		81349	RCR05G183KS
R157	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R158	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R159	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/8W	745-2362-000		81349	RCR05G392KS
R160	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R161	RESISTOR,FXD CMPSN, 18K, 10%, 1/4W	745-0794-000		81349	RCR07G183KS
R162	RESISTOR,FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R163	RESISTOR,FXD FILM, 169K, 1%, 1/8W	705-1103-000		81349	RN55D1693F
R164	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R165	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R166	RESISTOR,FXD FILM, 2.87K, 1%, 1/8W	705-1018-000		81349	RN55DC871F
R167	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R168	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R169	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R170	RESISTOR,FXD CMPSN, 3.3MEGO, 5%, 1/8W	745-1864-370		81349	RCR05G335JS
R171	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R172	RESISTOR,VAR 10K, 10%, 0.5W	382-0027-100		80294	3329H1-103
R173	RESISTOR,FXD CMPSN, 39K, 10%, 1/8W	745-2398-000		81349	RCR05G393KS
R174	RESISTOR,FXD CMPSN, 220K, 10%, 1/8W	745-2425-000		81349	RCR05G224KS
R175	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R176	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R177					
R178	RESISTOR,FXD FILM, 301K, 1%, 1/8W	705-1115-000		81349	RN55D3013F
R179					
R180	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
T1	TRANSFORMER,RF	278-0444-090		20462	278-0444-090
U1	INTEGRATED CIRCUIT	351-1125-010		02735	CA3076
U2,U3	INTEGRATED CIRCUIT	351-0043-010		04713	MC1596G
U4-U8	INTEGRATED CIRCUIT	351-1071-020		34335	1558H
U9	INTEGRATED CIRCUIT (ESDS)	351-8252-010		02735	CD4066BE
U10	INTEGRATED CIRCUIT (ESDS)	351-8297-010		02735	CD4081BF
U11,U12	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049EPC
U13,U14	INTEGRATED CIRCUIT (ESDS)	351-8306-010		27014	CD4071BMJ
U15,U16	INTEGRATED CIRCUIT (ESDS)	351-8479-010		04713	MC14538BCP
U17	INTEGRATED CIRCUIT (ESDS)	351-8258-010		27014	CD4027BMJ
U18	INTEGRATED CIRCUIT	351-1071-020		34335	1558H
U19	INTEGRATED CIRCUIT	351-1636-010		01295	SN74LS90N
U20	INTEGRATED CIRCUIT (ESDS)	351-6882-010		04713	MC14569BCP
U21	INTEGRATED CIRCUIT	351-1523-010		27014	DM54LS00J
U22	INTEGRATED CIRCUIT (ESDS)	351-8882-010		04713	MC145693CP
U23	INTEGRATED CIRCUIT	351-7768-010		04713	MC1643P
U24	INTEGRATED CIRCUIT	351-1071-020		34335	1558H
U25	INTEGRATED CIRCUIT (ESDS)	351-8160-080		31039	SCL40118C
U26	INTEGRATED CIRCUIT (ESDS)	351-8184-020		04713	MC14023EAL
U27	INTEGRATED CIRCUIT (ESDS)	351-8188-030		07263	F40120M
U28	INTEGRATED CIRCUIT (ESDS)	351-8160-030		31039	SCL40138C
VR1	SEMICOND DEVICE	353-2710-000		07263	1N751A
VR2	SEMICOND DEVICE	353-3591-510		04713	1N4627
VR3,VR4	SEMICOND DEVICE	353-2710-000		07263	1N751A
VR5	SEMICOND DEVICE	353-3157-000		81483	1N935A
XY1	OVEN,XTAL	292-0329-050		12020	PCL1-43-05
Y1	CRYSTAL UNIT,QTZ 9.900000MHZ	289-7157-080		00809	289-7157-080

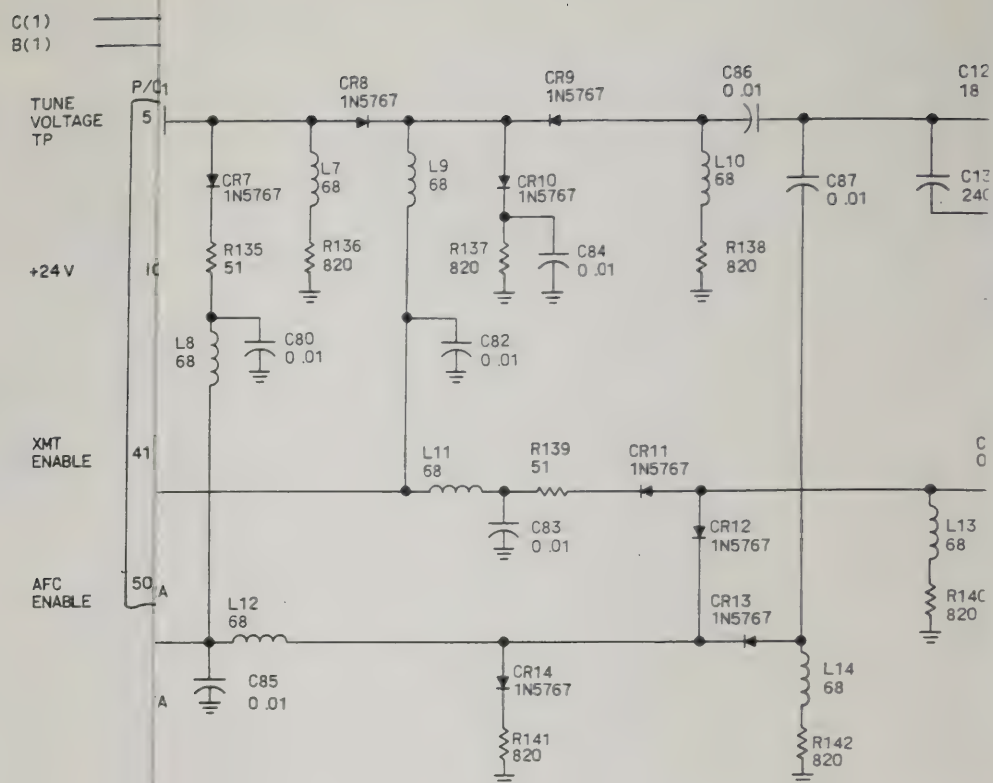


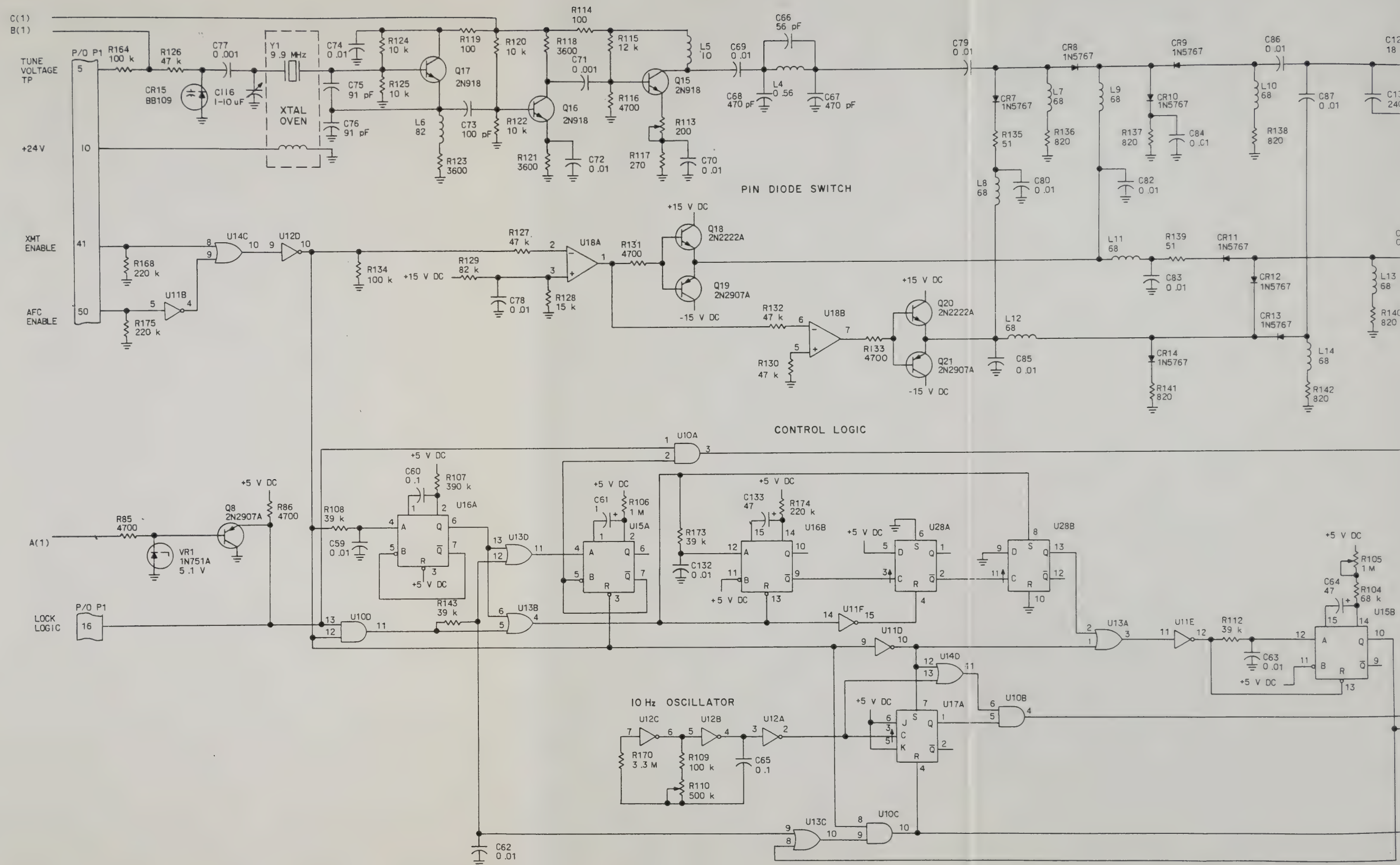
634-6903

AFC, Schematic Diagram
Figure 7 (Sheet 5)



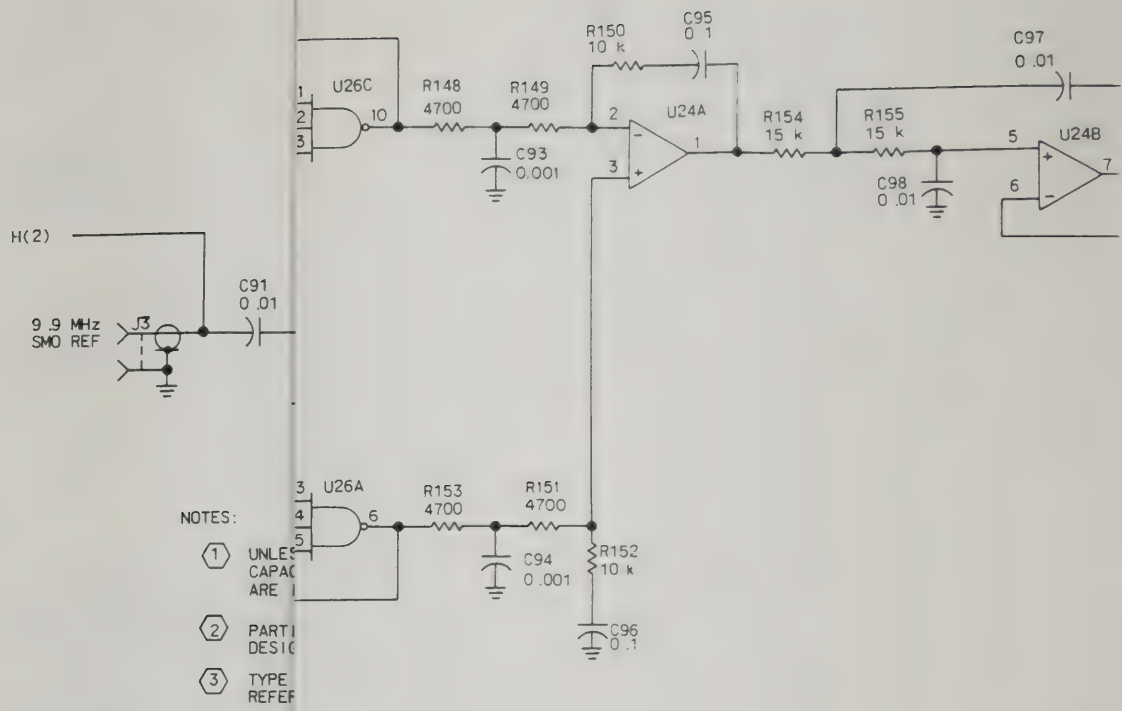
AFC, Schematic Diagram
Figure 7 (Sheet 5)





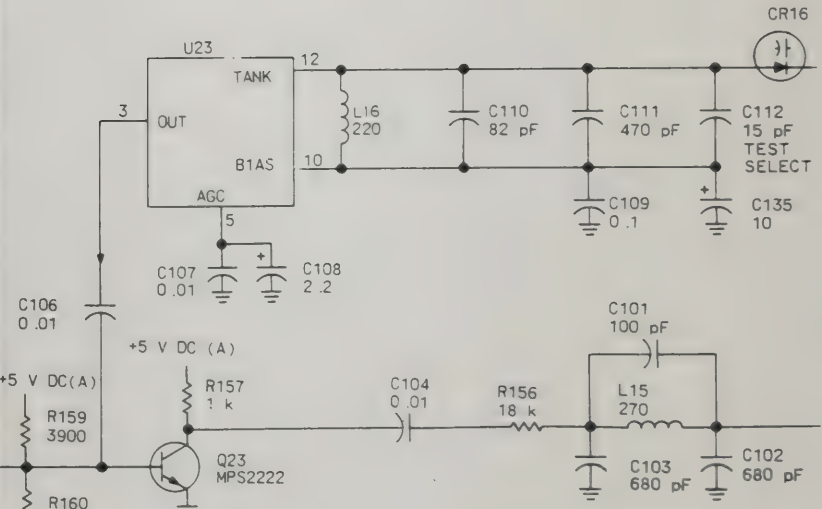
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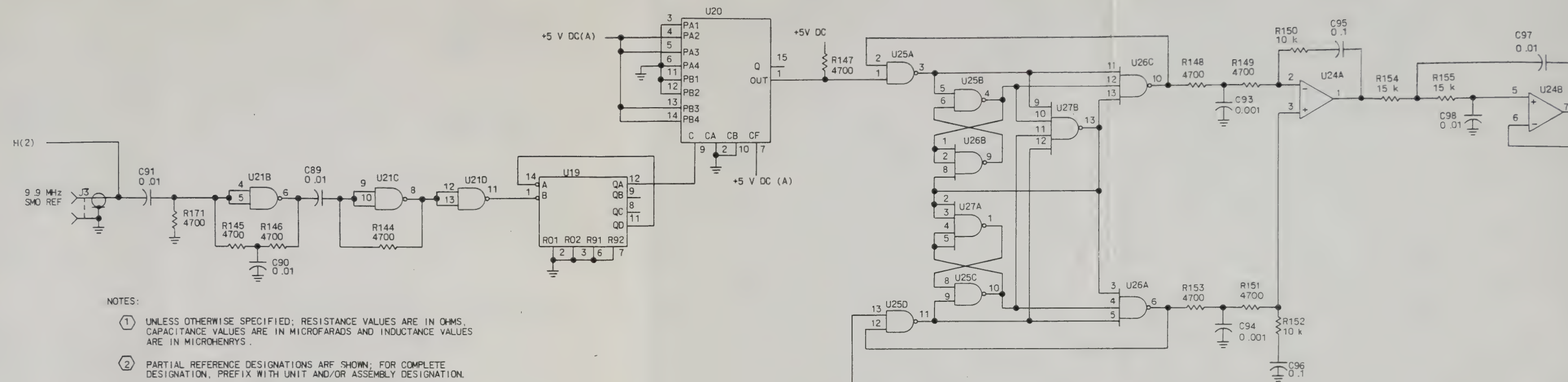


MICROCIR

REF	DES	C
U1	C	
U2	M	
U3	M	
U4	M	
U5	M	
U6	M	
U7	M	
U8	M	
U9	4	
U10	4	
U11	4	
U12	4	
U13	4	
U14	4	
U15	M	
U16	M	
U17	4	
U18	MC	
U19	74	
U20	MC	
U21	7	
U22	M	
U23	M	
U24	M	
U25	4	
U26	4	
U27	4	
U28	4	



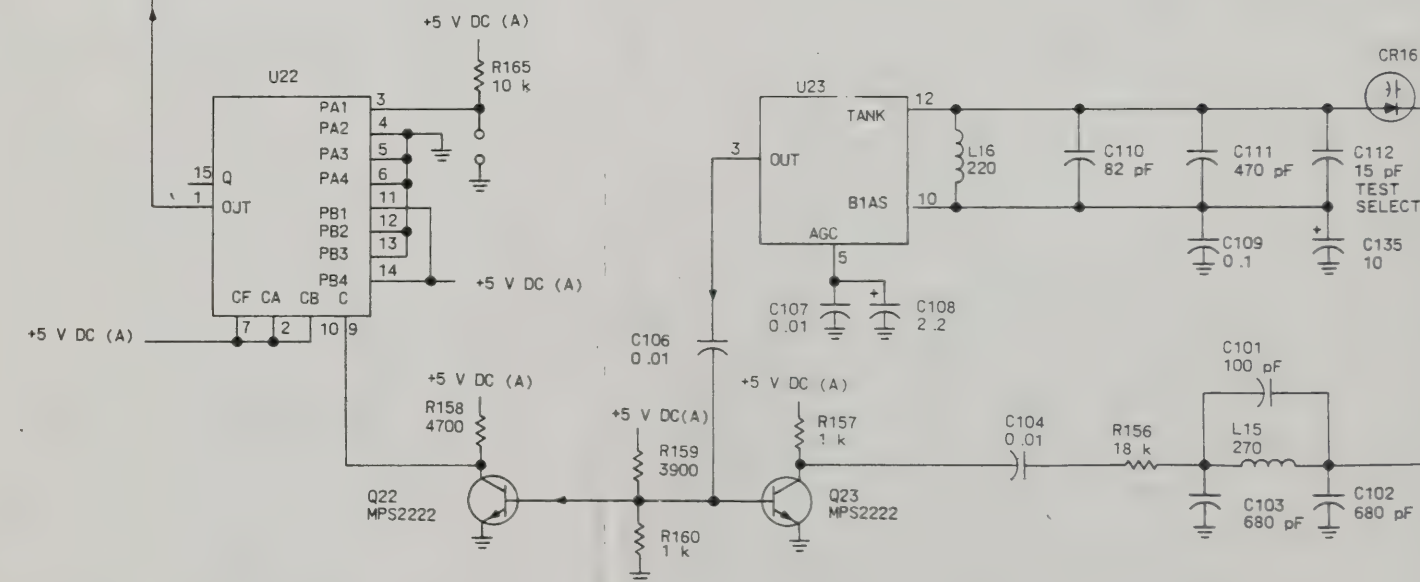
450 / 455 kHz PHASE LOCKED LOOP



- NOTES:
- 1 UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS.
 - 2 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
 - 3 TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.

MICROCIRCUIT INFORMATION

REF DES	COMMON DEVICE	PWR (V DC)						SPARE SECTIONS
		+5	GND	+5(A)	+15	-15	-5 RGLTD	
U1	CA3076							
U2	MC1596G							
U3	MC1596G							
U4	MC1558G				8	4		
U5	MC1558G				8	4		
U6	MC1558G				8	4		
U7	MC1558G				8	4		
U8	MC1558G				8		4	
U9	4066				14		7	
U10	4081	14	7					
U11	4049	1	8					A
U12	4049	1	8					E, F
U13	4071	14	7					
U14	4071	14	7					B
U15	MC14538	16	8					
U16	MC14538	16	8					
U17	4027	14	8					
U18	MC1558G				8	4		
U19	74LS90		10	5				
U20	MC14569		8	16				
U21	74LS00		7	14				A
U22	MC14569		8	16				
U23	MC1648		7,8	14, 1				
U24	MC1558G		4		8			
U25	4011		7	14				
U26	4023		7	14				
U27	4012		7	14				
U28	4013	14	7					





**Rockwell
International**

instructions

Collins Telecommunications Products Division

523-0770520-001211

1 October 1980

VBFO
(638-6067-002)

VBFO

(638-6067-002)

Printed in USA

1. DESCRIPTION

VBFO 638-6067-002 as shown in figure 1 is a 2-layer planar card with a 56-pin edge-on connector (2 layers, 28 pins each) and two subminiature rf connectors.

The vbfo consists of a synthesized bfo which uses several different inputs to determine its output frequency.

2. PRINCIPLES OF OPERATION

2.1 General

The vbfo produces a bfo offset if frequency output (440.01 to 459.99 kHz in 10 Hz steps) that is operational only in the receive modes of CW, SSB, or ISB.

The vbfo circuits are enabled by a vbfo enable signal (logic 1) at P1-46. The vbfo/450-kHz control enables

the vco, output switching, and the phase/frequency discriminator. Refer to figure 2.

The vbfo receives the following inputs:

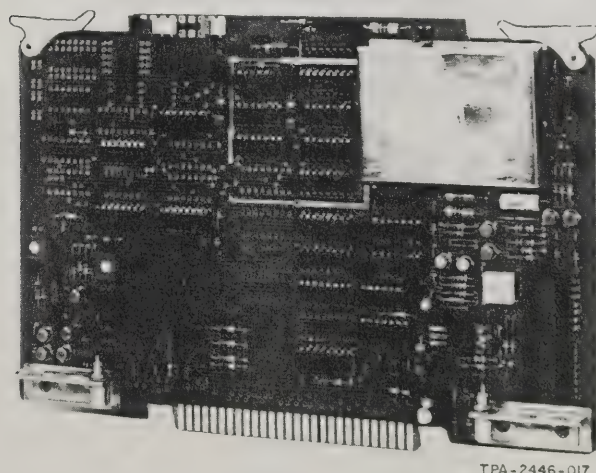
- 450-kHz reference.
- Vbfo/450-kHz switching inputs.
- Parallel bcd vbfo input.
- Necessary associated control signals to activate and control the vbfo output frequency.

2.2 Synthesized BFO

A 450-kHz reference input signal at J2 is applied through buffer circuit Q16 and is divided by 1500 (by fixed dividers U38, U39, and U33) to produce 300-Hz reference frequency signals. These are applied to sampling gates U9A, U9B, U9C, and U9D in the voltage-controlled oscillator (vco), through sampling logic circuits U34, Q4, and Q5.

Synchronous reversible up/down counters U19, U24, U27, U31, and U32 form a programmable frequency divider with variable division ratios ranging from 44 001 to 45 999, with 45 000 the division ratio for 0 vbfo offset from the selected operating frequency. The division ratios for the various vbfo settings are determined by the bcd frequency information from the preset vbfo (parallel bcd) input. The +/-signal is determined externally, and is fed in at P1-19 which conditions up/down and reset logic circuit U13 and U14. The output of the programmable divider circuit is applied through the phase/frequency discriminator and then to the sampling gates in the vco assembly.

The vco assembly generates an output frequency that ranges from 13.2003 to 13.7997 MHz with 13.500 MHz as the center frequency (0 vbfo offset). The output



VBFO
Figure 1

523-0770520-001211

from the vco assembly is used as the clock signal for the programmable divider circuit and is divided by 30 (by fixed divider circuits U3 and U1) to become the vbfo output signal that ranges from 440.01 to 459.99 kHz.

For offsets which are greater than 0.00 kHz, the division ratio of the programmable dividers is accomplished by loading 45 000 into the counters, adding the vbfo offset frequency, and then allowing the counters to count down to 00 000. Assume that the bfo is set to the maximum deviation of 9.990 kHz above the operating frequency. The +/- input goes to + (logic 1), which causes the up/down and reset logic circuit to set the programmable divider circuit to the required 45 000 division ratio and to a countdown state. The 999 input from the bcd frequency input is loaded, making a total division ratio of 45 999 (the countdown starting point). The counter circuit then divides by counting down to 00 000. The clock input to the divider circuit, at this point, will be different from the required 13.7997 MHz depending upon the previous vbfo offset frequency. This causes the output of the counter circuit applied to the sampling gates to be less than 300-Hz nominal frequency. The sampling gates in the vco assembly function basically as a phase comparator. The 300-Hz control inputs, produced from 450-kHz reference input, enable the gates at the 300-Hz control (logic 0) pulse rate. If the input signal from the programmable divider is out of phase, the out-of-phase portion of the signal is passed through the gates during the enable period. The more out of phase the input signal, the greater the amplitude of the output signal from the gates. The output of the gates is filtered and amplified by capacitor C29 and FET Q8 to produce a dc error voltage. The dc error voltage is applied across voltage variable capacitance diode VR4. As the voltage across VR4 increases, its capacitance decreases, thus increasing the frequency of the voltage-controlled oscillator circuit U4. Conversely, as the dc error voltage across VR4 decreases, the capacitance increases and decreases the oscillator circuit frequency. As the vco output frequency increases toward 13.7997 MHz, the output frequency of the programmable divider circuit increases toward 300 Hz which, in turn, decreases the error voltage applied to VR4. When the oscillator output frequency reaches 13.7997 MHz, the output from the programmable divider circuit is 300 Hz (13.7997 MHz ÷ 45.999). The vco circuit locks at this frequency and remains until the bfo frequency information is changed. The 13.7997-MHz oscillator frequency is

divided by 30 to produce the 459.99-kHz if output signal that is applied to if amplifier for use in the SSB, ISB, and CW modes of operation.

If the bfo is set to a deviation below the operating frequency, the synthesizer functions are the same except the +/- input goes to logic 0 and the programmable divider circuit is set to a count-up state. For an offset of -9.990 kHz, the bfo begins counting at 55 000 plus the deviation, bfo offset of 9.990 kHz or, a 55 999 start counting point. The count progresses toward a maximum count of 100 000. This produces the division ratio of 44 001 (100 000 minus 55 999). The error voltage applied to VR4 decreases and causes the output frequency to decrease. When the output of the programmable divider reaches 300 Hz, the oscillator output frequency will lock at 13.2003 and when divided by 30 will produce the 440.01-kHz vbfo output signal.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the vbfo are listed in the maintenance section of this instruction book.

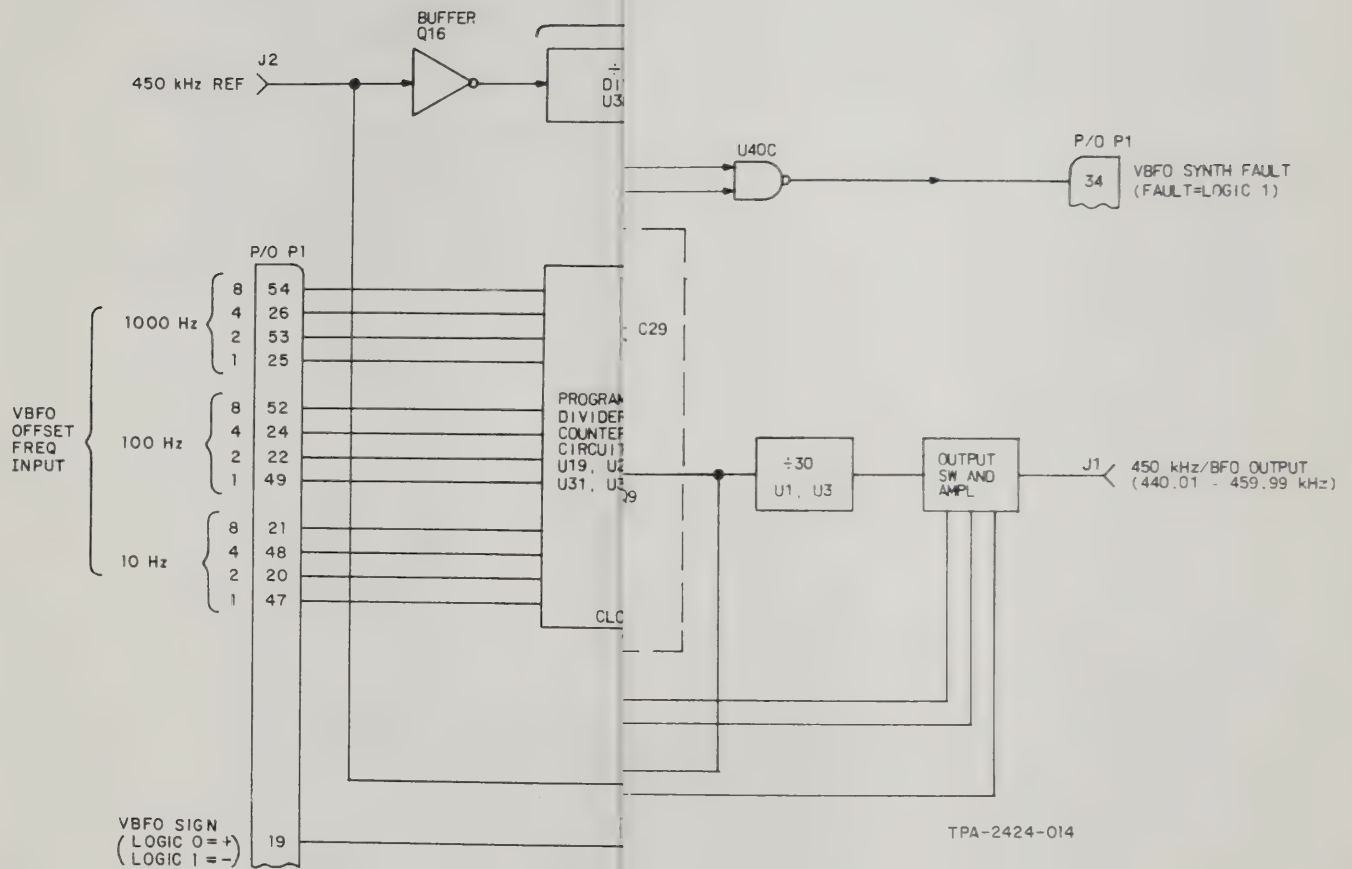
3.2 Testing

The test procedures in this section check total performance of the vbfo. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

Note

In the testing/troubleshooting procedures and the alignment/adjustment, the front panel controls are set as follows for the indicated mode/condition.

MODE/ CONDITION	HF-8050()	HF-8054()	HF-8070()
CW mode	MODE to SSB/CW	MODE to CW	MODE to CW
Vbfo enabled	BFO to VAR	VBFO to VAR	BFO to VAR
Vbfo disabled	BFO to FIX	VBFO to FXD	BFO to FIX



VBFO, Block Diagram
Figure 2

from the vco assembly is used as the clock signal for the programmable divider circuit and is divided by 30 (by fixed divider circuits U3 and U1) to become the vbfo output signal that ranges from 440.01 to 459.99 kHz.

For offsets which are greater than 0.00 kHz, the division ratio of the programmable dividers is accomplished by loading 45 000 into the counters, adding the vbfo offset frequency, and then allowing the counters to count down to 00 000. Assume that the bfo is set to the maximum deviation of 9.990 kHz above the operating frequency. The +/- input goes to + (logic 1), which causes the up/down and reset logic circuit to set the programmable divider circuit to the required 45 000 division ratio and to a countdown state. The 999 input from the bcd frequency input is loaded, making a total division ratio of 45 999 (the countdown starting point). The counter circuit then divides by counting down to 00 000. The clock input to the divider circuit, at this point, will be different from the required 13.7997 MHz depending upon the previous vbfo offset frequency. This causes the output of the counter circuit applied to the sampling gates to be less than 300-Hz nominal frequency. The sampling gates in the vco assembly function basically as a phase comparator. The 300-Hz control inputs, produced from 450-kHz reference input, enable the gates at the 300-Hz control (logic 0) pulse rate. If the input signal from the programmable divider is out of phase, the out-of-phase portion of the signal is passed through the gates during the enable period. The more out of phase the input signal, the greater the amplitude of the output signal from the gates. The output of the gates is filtered and amplified by capacitor C29 and FET Q8 to produce a dc error voltage. The dc error voltage is applied across voltage variable capacitance diode VR4. As the voltage across VR4 increases, its capacitance decreases, thus increasing the frequency of the voltage-controlled oscillator circuit U4. Conversely, as the dc error voltage across VR4 decreases, the capacitance increases and decreases the oscillator circuit frequency. As the vco output frequency increases toward 13.7997 MHz, the output frequency of the programmable divider circuit increases toward 300 Hz which, in turn, decreases the error voltage applied to VR4. When the oscillator output frequency reaches 13.7997 MHz, the output from the programmable divider circuit is 300 Hz (13.7997 MHz ÷ 45.999). The vco circuit locks at this frequency and remains until the bfo frequency information is changed. The 13.7997-MHz oscillator frequency is

divided by 30 to produce the 459.99-kHz if output signal that is applied to if amplifier for use in the SSB, ISB, and CW modes of operation.

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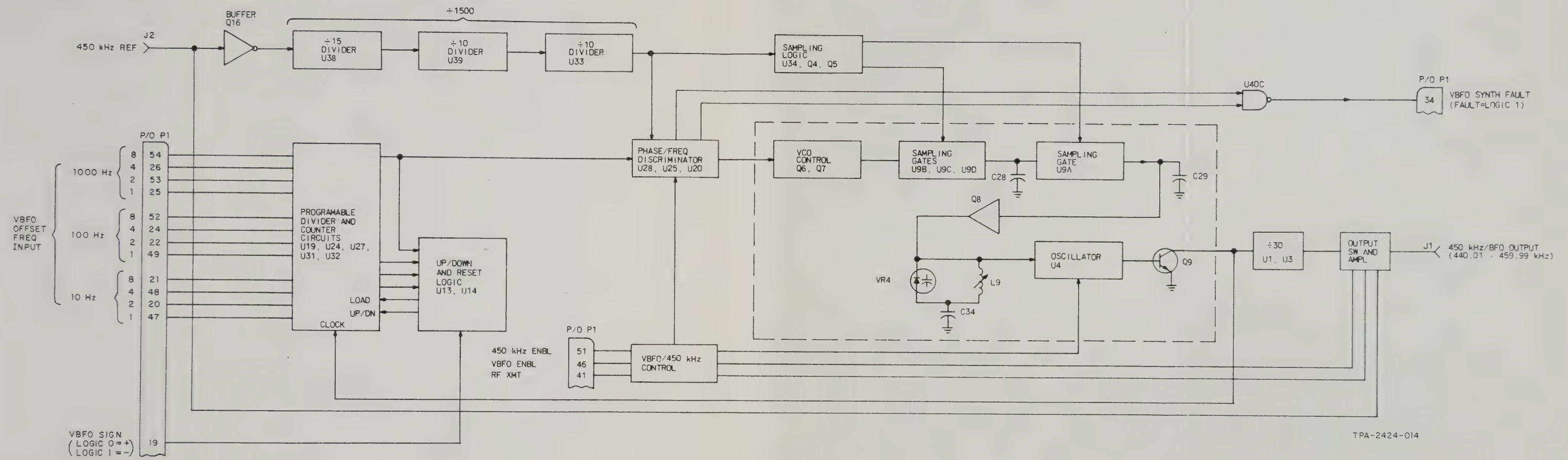
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The test procedures in this section check total performance of the vbfo. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

Note

In the testing/troubleshooting procedures and the alignment/adjustment, the front panel controls are set as follows for the indicated mode/condition.

MODE/ CONDITION	HF-8050()	HF-8054()	HF-8070()
CW mode	MODE to SSB/CW	MODE to CW	MODE to CW
Vbfo enabled	BFO to VAR	VBFO to VAR	BFO to VAR
Vbfo disabled	BFO to FIX	VBFO to FXD	BFO to FIX



VBFO, Block Diagram
Figure 2

Table 1. VBFO, Testing, and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit containing the vbfo that is to be tested. b. Remove vbfo card. Install it on an extender card and place it in the unit. c. Set unit LINE SELECTOR for power source available (100/115/215/230 V ac). Note Ensure that proper fuse is installed for power source used. d. Connect unit to available power source.		
2. Initial check	a. Front-panel controls set as follows: PWR to on. CONT to LCL. Mode to CW. BANDWIDTH to 16 (receiver only). KEY to NORM (receiver-exciter only). Vbfo disabled. AGC to FAST. RF GAIN to full cw. b. Measure dc voltages between the following points and ground (TP1). P1-23 P1-27	+15 $\pm$1.0 V dc. +5 $\pm$0.5 V dc.	Check associated power supply.
3. Vbfo/450-kHz output switch	a. Front-panel controls set as follows: PWR to on. CONT to LCL. Mode to AM. BANDWIDTH to 16 (receiver only). KEY to NORM (receiver-exciter only). Vbfo disabled. AGC to OFF. RF GAIN to full cw.		
(Cont)			

Table 1. VBFO, Testing, and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																				
3. (Cont)	Note Logic 1 = NLT+3.0 V dc Logic 0 = NMT 0.5 V dc b. Note logic level at TP8. c. Note output frequency at J1. d. Repeat steps 3.b and 3.c at each of the following conditions: <table border="1"> <thead> <tr> <th>MODE</th><th>VBFO</th><th>TP8</th><th>J1</th></tr> </thead> <tbody> <tr> <td>AM</td><td>Enabled</td><td>Logic 0</td><td>0 Hz</td></tr> <tr> <td>Receiver only:</td><td></td><td></td><td></td></tr> <tr> <td> CW</td><td>Disabled</td><td>Logic 0</td><td>450 kHz</td></tr> <tr> <td> CW</td><td>Enabled</td><td>Logic 1</td><td>*Vbfo</td></tr> <tr> <td>Receiver-exciter only:</td><td></td><td></td><td></td></tr> <tr> <td> CW</td><td>Disabled</td><td>Logic 0</td><td>450 kHz</td></tr> <tr> <td> CW</td><td>Enabled</td><td>Logic 1</td><td>**Vbfo</td></tr> <tr> <td> CW</td><td>Enabled</td><td>Logic 1</td><td>*Vbfo</td></tr> </tbody> </table> *Vbfo frequency equals 450 kHz plus the algebraic sum of the vbfo offset. **With receiver-exciter in transmit J1 will be 450 kHz.	MODE	VBFO	TP8	J1	AM	Enabled	Logic 0	0 Hz	Receiver only:				CW	Disabled	Logic 0	450 kHz	CW	Enabled	Logic 1	*Vbfo	Receiver-exciter only:				CW	Disabled	Logic 0	450 kHz	CW	Enabled	Logic 1	**Vbfo	CW	Enabled	Logic 1	*Vbfo	Logic 0 0 Hz	Check U21 and associated circuit. Check U21, U29, and associated circuits. Same as step 3.b and 3.c.
MODE	VBFO	TP8	J1																																				
AM	Enabled	Logic 0	0 Hz																																				
Receiver only:																																							
CW	Disabled	Logic 0	450 kHz																																				
CW	Enabled	Logic 1	*Vbfo																																				
Receiver-exciter only:																																							
CW	Disabled	Logic 0	450 kHz																																				
CW	Enabled	Logic 1	**Vbfo																																				
CW	Enabled	Logic 1	*Vbfo																																				
(Cont)	Caution In the following procedures, when applying +5 V dc or 0 V dc (ground) to the indicated points, apply these levels through a 100-ohm series limiting resistor. The +5 V dc source should be obtained from the receiver power supply so that the integrated circuit supply voltages are not exceeded by the applied levels. Note 450-kHz enable (P1-51). e. Apply +5 V dc to TP4, rf xmt (receiver only). Set KEY switch to LOCK (receiver-exciter only).																																						

Table 1. VBFO, Testing, and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																				
3. (Cont)	f. Repeat steps 3.b and 3.c at each of the following conditions: <table border="1"> <thead> <tr> <th>MODE</th><th>VBFO</th><th>TP8</th><th>J1</th></tr> </thead> <tbody> <tr> <td>AM</td><td>Disabled</td><td>Logic 0</td><td>0 Hz</td></tr> <tr> <td>AM</td><td>Enabled</td><td>Logic 0</td><td>0 Hz</td></tr> <tr> <td>Receiver only:</td><td></td><td></td><td></td></tr> <tr> <td> CW</td><td>Disabled</td><td>Logic 0</td><td>450 kHz</td></tr> <tr> <td> CW</td><td>Enabled</td><td>Logic 1</td><td>450 kHz</td></tr> <tr> <td>Receiver-exciter only:</td><td></td><td></td><td></td></tr> <tr> <td> CW</td><td>Disabled</td><td>Logic 0</td><td>450 kHz</td></tr> <tr> <td> CW</td><td>Enabled</td><td>Logic 1</td><td>450 kHz</td></tr> </tbody> </table> g. Remove +5 V dc from TP4 (receiver only). Set KEY switch to NORM (receiver-exciter only). h. Connect a spectrum analyzer to J1. i. Set vbfo offset frequency for 1000 Hz. j. Note level of 451-kHz if signal at J1. k. Measure level of sidebands caused by 300-Hz vbfo reference signal at J1. l. Apply +5 V dc to TP4, rf xmt (receiver only). Set KEY switch to LOCK (receiver-exciter only). m. Measure level of 451 kHz if signal at J1. n. Note level of 450 kHz if signal at J1. o. Remove +5 V dc from TP4 (receiver only). Set KEY switch to NORM (receiver-exciter only). p. Measure level of 450-kHz if signal at J1. q. Set vbfo offset frequency for 9990 Hz. r. Using a distortion analyzer, measure total harmonic distortion at J1. s. Set vbfo offset frequency for 0000 Hz.	MODE	VBFO	TP8	J1	AM	Disabled	Logic 0	0 Hz	AM	Enabled	Logic 0	0 Hz	Receiver only:				CW	Disabled	Logic 0	450 kHz	CW	Enabled	Logic 1	450 kHz	Receiver-exciter only:				CW	Disabled	Logic 0	450 kHz	CW	Enabled	Logic 1	450 kHz	Reference NLT 70 dB below 451-kHz reference. NLT 70 dB below reference in step 3.j. Reference NLT 70 dB below reference in step 3.n.	Same as step 3.b and 3.c. Check bypass and feedthrough capacitors and circuits associated with J1 output or return to factory for repair. Check U29A and associated circuits. Check U29D and associated circuits.
MODE	VBFO	TP8	J1																																				
AM	Disabled	Logic 0	0 Hz																																				
AM	Enabled	Logic 0	0 Hz																																				
Receiver only:																																							
CW	Disabled	Logic 0	450 kHz																																				
CW	Enabled	Logic 1	450 kHz																																				
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(Cont)																																							

Table 1. VBFO, Testing, and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																
3. (Cont)	t. Measure total harmonic distortion at J1.	NMT 3%	Same as step 3.k.																																
	u. Apply +5 V dc to TP4, rf xmt (receiver only). Set KEY switch to LOCK (receiver-exciter only).																																		
	v. Measure total harmonic distortion at J1.	NMT 3%	Same as step 3.k.																																
	w. Remove +5 V dc from TP4 (receiver only). Set KEY switch to NORM (receiver-exciter only).																																		
4. Frequency accuracy	a. Front-panel controls set as follows: PWR to on. CONT to LCL. Mode to CW. BANDWIDTH to 16 (receiver only). KEY to NORM (receiver-exciter only). Vbfo enabled. AGC to OFF. RF GAIN to full cw.																																		
	b. Connect a frequency counter to J1.																																		
	c. Measure the frequency outputs listed below. Check both positive and negative offset.	±5 Hz of listed output.	Check phase-lock loop.																																
	d. At each frequency measure vbfo synthesizer fault output using a dvm connected at TP2.	NMT 0.5 V dc.	Check U40C and associated circuit.																																
<table><tr><th rowspan="2">OFFSET (Hz)</th><th colspan="2">OUTPUT FREQUENCY</th></tr><tr><th>POSITIVE OFFSET (kHz)</th><th>NEGATIVE OFFSET (kHz)</th></tr><tr><td>9990</td><td>459.99</td><td>440.01</td></tr><tr><td>9980</td><td>459.98</td><td>440.02</td></tr><tr><td>9970</td><td>459.97</td><td>440.03</td></tr><tr><td>9960</td><td>459.96</td><td>440.04</td></tr><tr><td>9950</td><td>459.95</td><td>440.05</td></tr><tr><td>9940</td><td>459.94</td><td>440.06</td></tr><tr><td>9930</td><td>459.93</td><td>440.07</td></tr><tr><td>9920</td><td>459.92</td><td>440.08</td></tr><tr><td>9910</td><td>459.91</td><td>440.09</td></tr></table>				OFFSET (Hz)	OUTPUT FREQUENCY		POSITIVE OFFSET (kHz)	NEGATIVE OFFSET (kHz)	9990	459.99	440.01	9980	459.98	440.02	9970	459.97	440.03	9960	459.96	440.04	9950	459.95	440.05	9940	459.94	440.06	9930	459.93	440.07	9920	459.92	440.08	9910	459.91	440.09
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TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																														
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5. Vbfo synthesizer fault	a. Front-panel controls set as follows: PWR to ON. CONT to LCL. Mode to CW. BANDWIDTH to 16 (receiver only). KEY to NORM (receiver-exciter only). Vbfo enabled. AGC to OFF. RF GAIN to full cw.																																																																
	b. Using the thumbwheel switches, set vbfo offset frequency for 00 Hz.																																																																
	c. Measure output at P1-34 (vbfo synthesizer fault).	NMT 0.5 V dc.	Check U20 and associated circuit.																																																														
	d. Disconnect 450-kHz reference at J2.																																																																
	e. Measure output at P1-34.	NLT +3.0 V dc.	Same as step 7.c.																																																														
	f. Reconnect 450-kHz reference at J2.																																																																
	g. Measure output at P1-34.	NMT 0.5 V dc.	Same as step 7.c.																																																														
(Cont)																																																																	

Table 1. VBFO, Testing, and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	h. Repeat steps 7.c thru 7.g with vbfo offset Hz at each of the following settings: +7770 +3330 -3330 -7770	Same as steps 7.c. thru 7.g.	Same as step 7.c.
6. Test complete	a. Set PWR switch off. b. Disconnect external power from rear panel. c. Remove vbfo from extender and extender from unit. d. Reinstall vbfo in unit. e. Reinstall unit top cover.		

4. ALIGNMENT/ADJUSTMENT

4.1 Voltage Adjustment

- Perform table 1, test 1 and test 2.
- Connect a dvm between bottom end of R28 and ground TP1.
- Set front-panel controls as follows:

PWR to on.
 CONT to LCL.
 Mode to CW.
 BANDWIDTH to 16 (receiver only).
 KEY to NORM (receiver-exciter only).
 Vbfo enabled.
 AGC to OFF.
 RF GAIN to full cw.

- Adjust R7 for 12.0 ± 0.1 V dc at R28.
- Remove dvm.

4.2 Oscillator Adjustments

Note

To perform these adjustments, the oscillator can shield must be removed. Do not make these adjustments unless a repair has been made and necessary adjustment is indicated.

4.2.1 Oscillator Adjustment

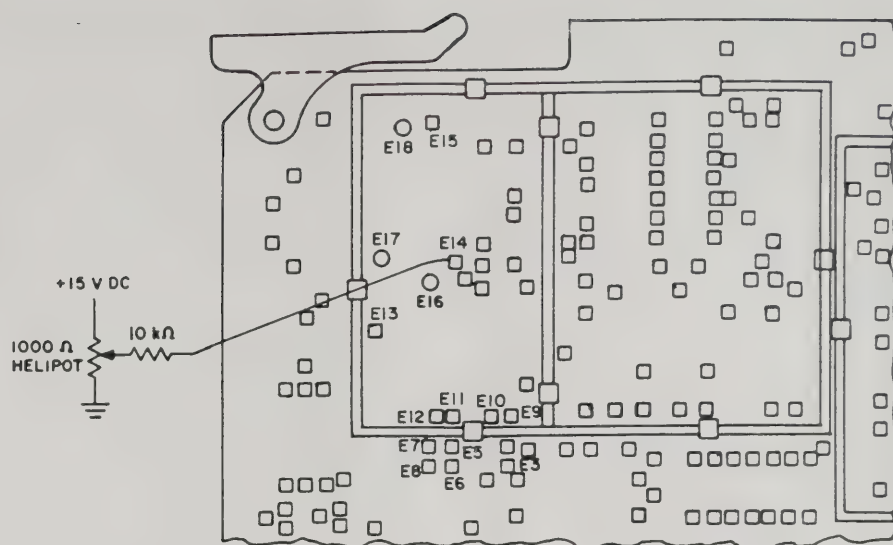
- Perform table 1, test 1 and test 2.
- Adjust R30 and R37 to maximum cw position.
- Connect a helipot to C29, as shown in figure 3.
- Connect a dvm to C29 (where helipot is connected).
- Apply a ground at bottom end of R13.
- Connect a frequency counter at J1.
- Set front-panel controls as follows:

PWR to on.
 CONT to LCL.
 Mode to CW.
 BANDWIDTH to 16 (receiver only).
 KEY to NORM (receiver-exciter only).
 Vbfo enabled.
 AGC to OFF.
 RF GAIN to full cw.

- Adjust the helipot for 5.5 ± 0.1 V dc at C29.
- Adjust L9 for a frequency of 450.0 ± 0.33 kHz at J1. Tuning slug should be toward the top of L9.

4.2.2 Frequency Range

- Adjust the helipot for 3.5 ± 0.1 V dc at C29. Frequency should be 460.000-kHz minimum.
- Adjust the helipot for 7.3 ± 0.1 V dc at C29. Frequency should be 440.000-kHz maximum.



TPA-1361-011

Setup for Oscillator Adjustments
Figure 3

Note

If step a or b is out of range, readjustment of L9 in the direction of the range error could correct the problem. If both steps a and b are out of range, repair is indicated.

- c. Remove helipot, dvm, and frequency counter.
- d. Remove R13 ground.

4.3 Output Level

- a. Perform table 1, test 1 and test 2.
- b. Connect an rf voltmeter through a 50-ohm load to J1.
- c. Set front panel-controls as follows:

PWR to on.
CONT to LCL.
Mode to CW
BANDWIDTH to 16 (receiver only).
KEY to NORM (receiver-exciter only).
Vbfo enabled.
AGC to OFF.
RF GAIN to full cw.

- d. Adjust R30 for 300 ± 10 mV rms at J1.
- e. Apply +5 V dc at TP4 (yellow).
- f. Adjust R37 for 300 ± 10 mV rms at J1.
- g. Remove +5 V dc from TP4.
- h. Remove rf voltmeter.

5. REPAIR

Repair of the vbfo is accomplished using the standard planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is

performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 4). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75222
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04099	CAPCO INC FORESIGHT INDUSTRIAL PARK P O BOX 2164 GRAND JUNCTION CO 81501
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV PO BOX 728 855 35TH STREET NE CEDAR RAPIDS IA 52406
14433	ITT SEMICONDUCTOR DIV WEST PALM BEACH FL
15818	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
18324	SIGNETICS CORP 811 E ARQUES SUNNYVALE CA 94086

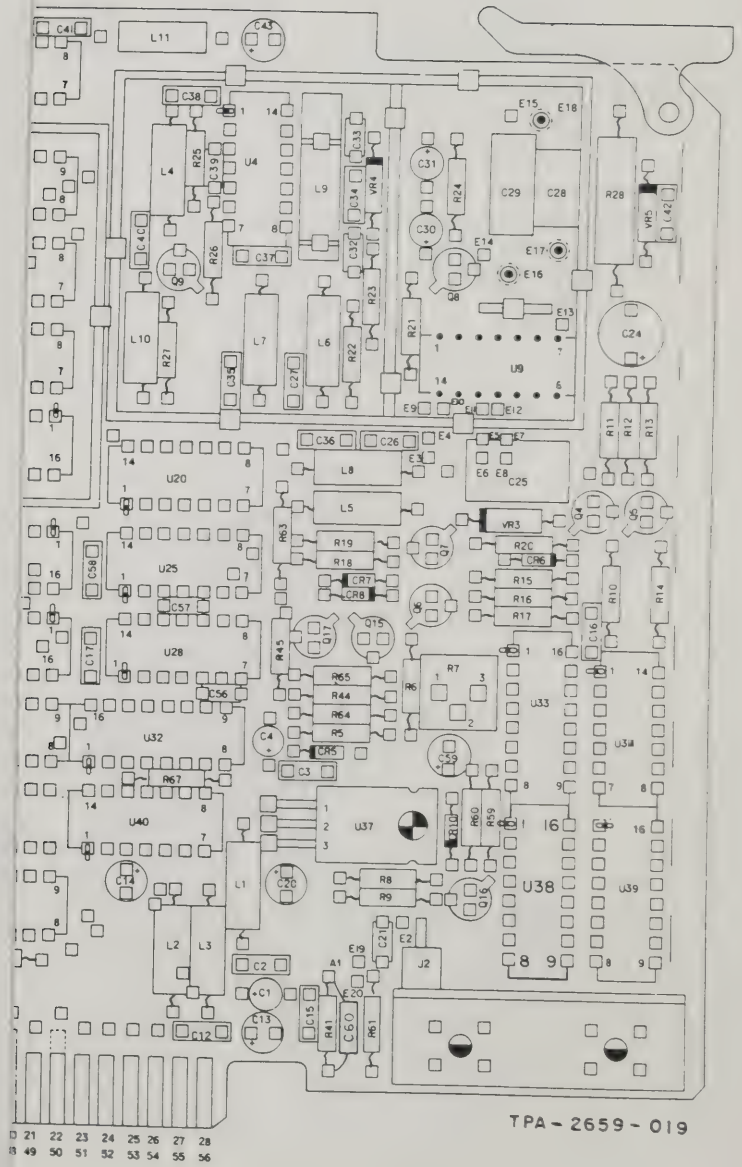
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
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27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
34335	ADVANCED MICRO DEVICES 901 THOMPSON PL SUNNYVALE CA 94086
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
81349	MILITARY SPECIFICATION
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
91637	DALE ELECTRONICS INC P O BOX 609 COLUMBUS NE 68601
96341	MICROWAVE ASSOCIATES INC NORTHWEST INDUSTRIAL PARK SOUTH AVE BURLINGTON MA 01803
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544

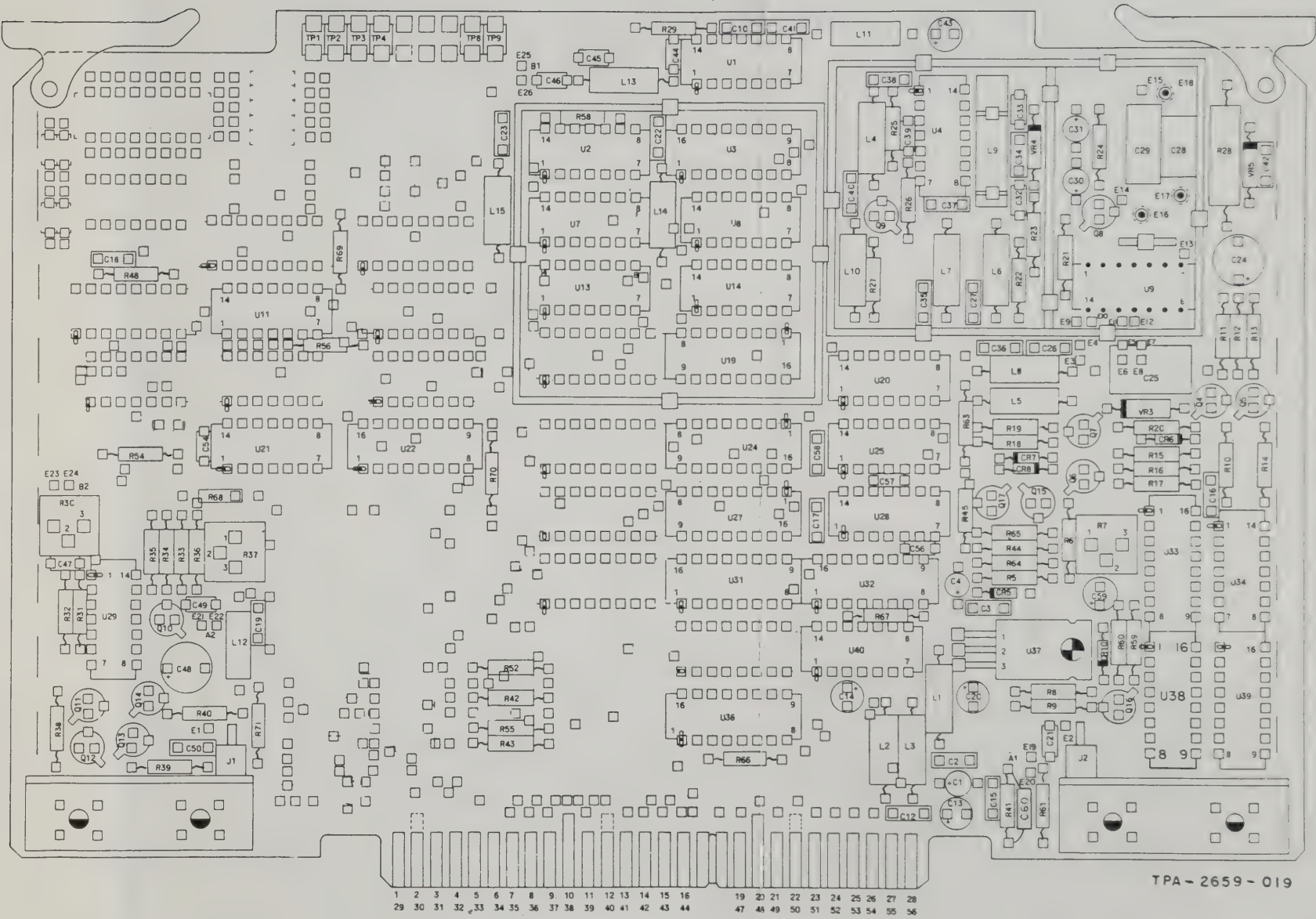
6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
VBFO	638-6067-002	REV D



VBFO, Schematic Diagram
 Figure 4 (Sheet 1 of 4)



TPA-2659-019

VBFO, Schematic Diagram
Figure 4 (Sheet 1 of 4)

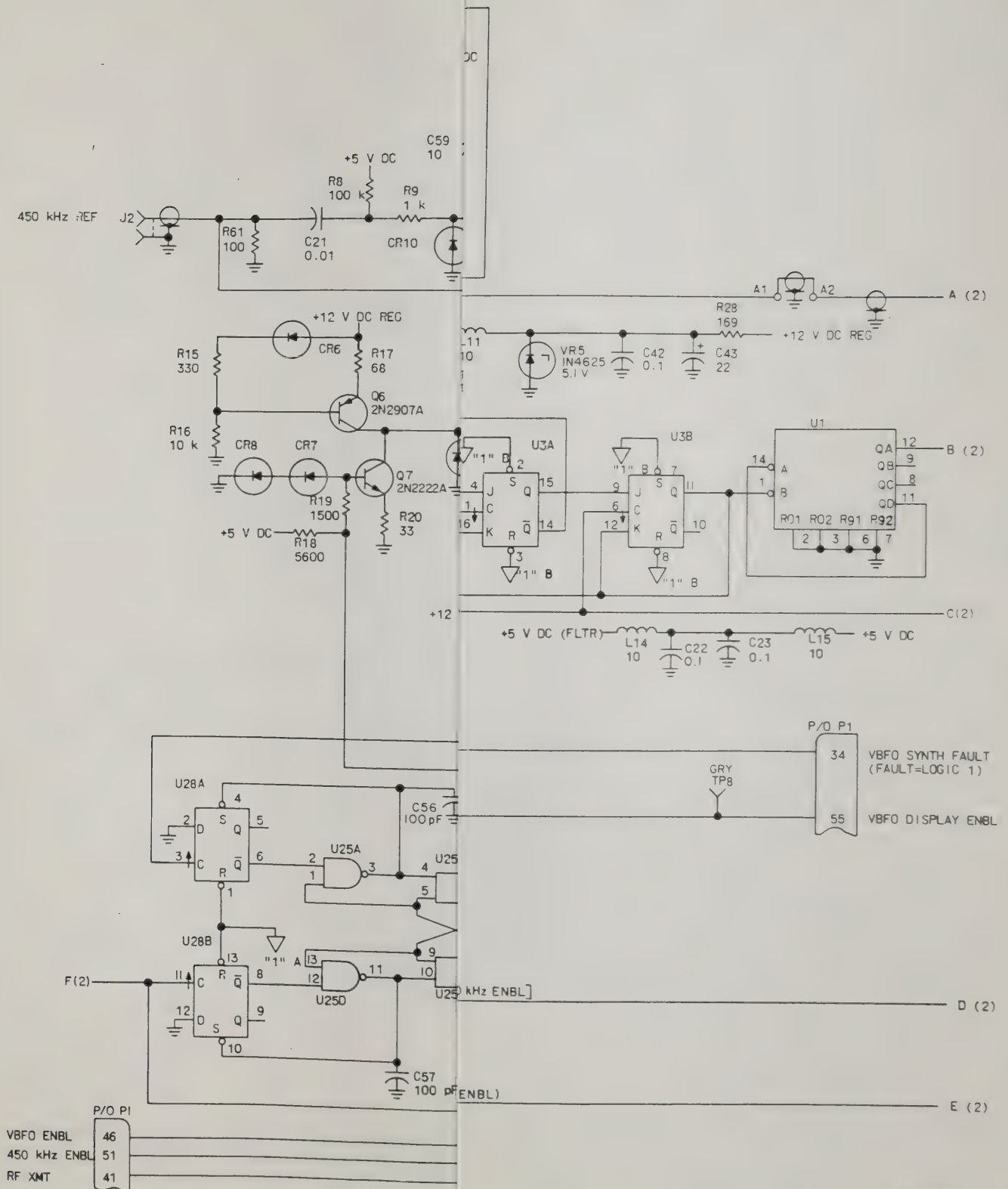
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
	VBFO (ESDS)	638-6067-002		
CR1-CR4	NOT USED			
CR5-CR8	SEMICONV DEVICE	353-3644-010		03508
CR9	NOT USED			
CR10	SEMICONV DEVICE	353-3644-010		03508
C1	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289
C2,C3	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C4	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289
C5-C9	NOT USED			
C10	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C11	NOT USED			
C12	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C13	CAPACITOR,FXD TMTLM ELCTLT, 4.7UF, 20%, 35V	184-9102-390		56289
C14	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289
C15-C19	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C20	CAPACITOR,FXD TMTLM ELCTLT, 15UF, 20%, 20V	184-9102-180		56289
C21	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
C22,C23	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C24	CAPACITOR,FXD TMTLM ELCTLT, 47UF, 20%, 20V	184-9102-190		56289
C25	CAPACITOR,FXD PLSTC DIEL, 0.47UF, 5%, 50V	933-1084-210		56289
C26,C27	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C28	CAPACITOR,FXD PLSTC DIEL, 0.1UF, 10%, 50V	933-1081-080		04099
C29	CAPACITOR,FXD PLSTC DIEL, 0.047UF, 10%, 50V	933-1043-500		04099
C30,C31	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289
C32,C33	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349
C34-C38	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C39	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349
C40-C42	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C43	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289
C44	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349
C45,C46	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349
C47	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
C48	CAPACITOR,FXD TMTLM ELCTLT, 47UF, 20%, 20V	184-9102-190		56289
C49	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349
C50	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C51-C53	NOT USED			
C54	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349
C55	NOT USED			
C56,C57	CAPACITOR,FXD CER DIEL, 100PF, 10%, 200V	913-4006-000		81349
C58	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C59	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289
C60	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
J1,J2	CONNECTOR,RCPT ELEC	357-7207-100		98291
L1	COIL,RF 33UH	240-2715-310		96906
L2,L3	COIL,RF 1UH	240-2715-130		96906
L4-L8	COIL,RF 10UH	240-2715-250		96906
L9	COIL,RF,VAR 2.4 TO 3.6UH	240-2739-010		
L10,L11	COIL,RF 10UH	240-2715-250		96906
L12	COIL,RF 1000UH	240-2715-490		96906
L13	COIL,RF 330UH	240-2715-430		96906
L14,L15	COIL,RF 10UH	240-2715-250		96906
Q1-Q3	NOT USED			
Q4,Q5	TRANSISTOR	352-0661-020		07263
Q6	TRANSISTOR	352-0551-010		15818
Q7	TRANSISTOR	352-0661-020		07263
Q8	TRANSISTOR (ESDS)	352-1018-010		04713
Q9	TRANSISTOR	352-0596-030		14433
Q10-Q17	TRANSISTOR	352-0661-020		07263
R1-R4	NOT USED			
R5	RESISTOR,FXD FILM, 226 OHMS, 1%, 1/8W	705-0965-000		81349
R6	RESISTOR,FXD FILM, 1.91K, 1%, 1/8W	705-3605-130		81349
R7	RESISTOR,VAR 200 OHMS, 20%, 1/2W	382-0038-020		91637
R8	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R9	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349
R10	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/4W	745-0776-000		81349
R11	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349
R12	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349
R13	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349
R14	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/4W	745-0776-000		81349
R15	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349
R16	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349
R17	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349
R18	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/4W	745-0776-000		81349
R19	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349
R20	RESISTOR,FXD CHPSN, 33 OHMS, 10%, 1/4W	745-0695-000		81349
R21	RESISTOR,FXD FILM, 14.7K, 1%, 1/8W	705-1052-000		81349
R22	RESISTOR,FXD FILM, 31.6K, 1%, 1/8W	705-1068-000		81349
R23	RESISTOR,FXD FILM, 46.4K, 1%, 1/8W	705-1076-000		81349
R24	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349
R25	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/4W	745-0770-000		81349
R26	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349
R27	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/4W	745-0722-000		81349
R28	RESISTOR,FXD FILM, 169 OHMS, 1%, 1/2W	705-7059-000		81349
R29	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349
R30	RESISTOR,VAR 1K, 20%, 1/2W	382-0038-040		91637
R31	RESISTOR,FXD CHPSN, 27K, 10%, 1/4W	745-0800-000		81349
R32	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349
R33	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349
R34	RESISTOR,FXD CHPSN, 12K, 10%, 1/4W	745-0788-000		81349
R35	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349

PARTS LIST

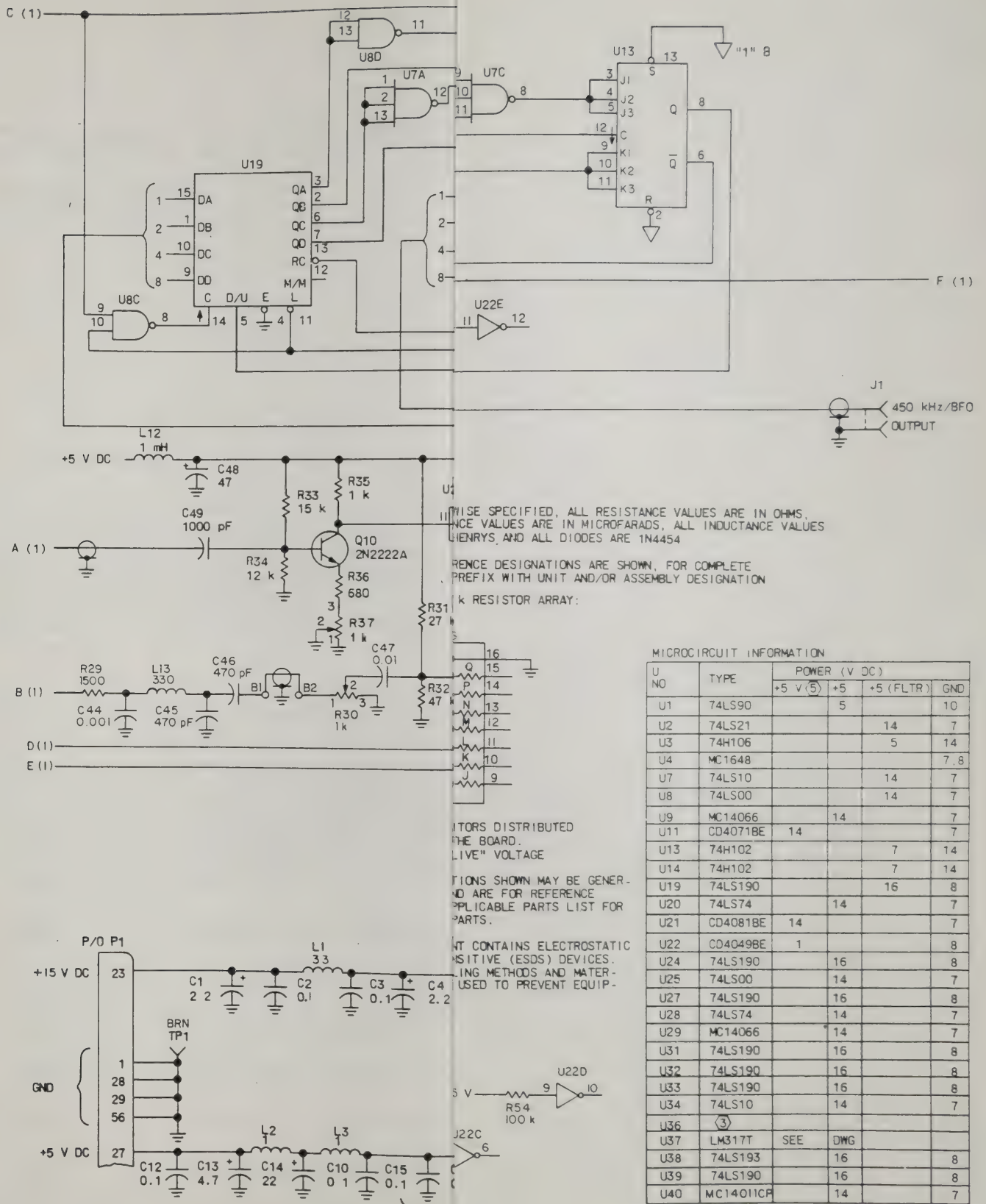
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	VBFO (ESDS)	638-6067-002				R36	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR07G681KS
C11-C14	NOT USED					R37	RESISTOR,VAR 1K, 20%, 1/2W	382-0038-040		91637	101T10000
C15-C18	SEMICONV DEVICE	353-3644-010		03508	1N4454GE	R38	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
C19	NOT USED					R39	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
C20	SEMICONV DEVICE	353-3644-010		03508	1N4454GE	R40	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
C21	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990225X0025BB1	R41-R43	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
C22,C3	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	R44	RESISTOR,FXD CHPSN, 56K, 10%, 1/4W	745-0812-000		81349	RCR07G563KS
C4	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990225X0025BB1	R45	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
C5-C9	NOT USED					R46,R47	NOT USED				
C10	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	R48	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
C11	NOT USED					R49-R51	NOT USED				
C12	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	R52	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
C13	CAPACITOR,FXD TMTLM ELCTLT, 4.7UF, 20%, 35V	184-9102-390		56289	1990475X00350B1	R53	NOT USED				
C14	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289	1990226X0010CB1	R54	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
C15-C19	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	R55	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
C20	CAPACITOR,FXD TMTLM ELCTLT, 15UF, 20%, 20V	184-9102-180		56289	1990156X0020DB1	R56	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
C21	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K	R57	NOT USED				
C22,C23	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	R58-R60	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
C24	CAPACITOR,FXD TMTLM ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	1960239	R61	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
C25	CAPACITOR,FXD PLSTC DIEL, 0.47UF, 5%, 50V	933-1084-210		56289	LP88A1A474J	R62	NOT USED				
C26,C27	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	R63,R64	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
C28	CAPACITOR,FXD PLSTC DIEL, 0.1UF, 10%, 50V	933-1081-080		04099	CRCL-080	R65	RESISTOR,FXD CHPSN, 56K, 10%, 1/4W	745-0812-000		81349	RCR07G563KS
C29	CAPACITOR,FXD PLSTC DIEL, 0.047UF, 10%, 50V	933-1043-500		04099	CRCS-500	R66	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
C30,C31	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990225X0025BB1	R67	RESISTOR,FXD CHPSN, 56K, 10%, 1/4W	745-0812-000		81349	RCR07G563KS
C32,C33	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K	R68-R70	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
C34-C38	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
C39	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K	TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
C40-C42	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	TP3	JACK,TIP ORN	360-0484-050		74970	105-1106-011
C43	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289	1990226X0010CB1	TP4	JACK,TIP YEL	360-0484-060		74970	105-1107-011
C44	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K	TP5-TP7	NOT USED				
C45,C46	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K	TP8	JACK,TIP GRA	360-0484-100		74970	105-1113-011
C47	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K	TP9	JACK,TIP WHT	360-0484-010		74970	105-1101-011
C48	CAPACITOR,FXD TMTLM ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	1960239	U1	INTEGRATED CKT	351-1636-010		01295	SN74LS90N
C49	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K	U2	INTEGRATED CKT	351-1785-010		01295	SN74LS21N
C50	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	U3	INTEGRATED CKT	351-7766-010		07263	74H106PC
C51-C53	NOT USED					U4	INTEGRATED CKT	351-7768-010		04713	MC1648P
C54	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K	U5,U6	NOT USED				
C55	NOT USED					U7	INTEGRATED CKT	351-1523-230		27014	DM74LS10N
C56,C57	CAPACITOR,FXD CER DIEL, 100PF, 10%, 200V	913-4006-000		81349	CK05BX101K	U8	INTEGRATED CKT	351-1523-110		18324	N74LS00N
C58	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	U9	INTEGRATED CKT (ESDS)	351-8252-010		02735	CD4066BE
C59	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	1990106X0025CB1	U10	NOT USED				
C60	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K	U11	INTEGRATED CKT (ESDS)	351-8287-010		02735	CD4071BE
J1,J2	CONNECTOR,RCPT ELEC	357-7207-100		98291	52-046-0000	U12	NOT USED				
L1	COIL,RF 33UH	240-2715-310		96906	MS75089-5	U13,U14	INTEGRATED CKT	351-7767-010		07263	74H102
L2,L3	COIL,RF 1UH	240-2715-130		96906	MS75088-1	U15-U18	NOT USED				
L4-L8	COIL,RF 10UH	240-2715-250		96906	MS75088-13	U19	INTEGRATED CKT	351-1948-010		01295	SN74LS190N
L9	COIL,RF,VAR 2.4 TO 3.6UH	240-2739-010		96906	MS75088-13	U20	INTEGRATED CKT	351-1525-040		04713	SN74LS74AN
L10,L11	COIL,RF 10UH	240-2715-250		96906	MS75088-13	U21	INTEGRATED CKT (ESDS)	351-8287-030		02735	CD4001BE
L12	COIL,RF 1000UH	240-2715-490		96906	MS75089-23	U22	INTEGRATED CKT (ESDS)	351-8159-210		07263	F4049BPC
L13	COIL,RF 330UH	240-2715-430		96906	MS75089-17	U23	NOT USED				
L14,L15	COIL,RF 10UH	240-2715-250		96906	MS75088-13	U24	INTEGRATED CKT	351-1948-010		01295	SN74LS190N
Q1-Q3	NOT USED					U25	INTEGRATED CKT	351-1523-110		18324	N74LS00N
Q4,Q5	TRANSISTOR	352-0661-020		07263	2N2222A	U26	NOT USED				
Q6	TRANSISTOR	352-0551-010		15818	2N2907A	U27	INTEGRATED CKT	351-1948-010		01295	SN74LS190N
Q7	TRANSISTOR	352-0661-020		07263	2N2222A	U28	INTEGRATED CKT	351-1525-040		04713	SN74LS74AN
Q8	TRANSISTOR (ESDS)	352-1018-010		04713	2N3796	U29	INTEGRATED CKT (ESDS)	351-8252-010		02735	CD4066BE
Q9	TRANSISTOR	352-0596-030		14433	2N2369A	U30	NOT USED				
Q10-Q17	TRANSISTOR	352-0661-020		07263	2N2222A	U31-U33	INTEGRATED CKT	351-1948-010		01295	SN74LS190N
R1-R4	NOT USED					U34	INTEGRATED CKT	351-1523-230		27014	DM74LS10N
R5	RESISTOR,FXD FILM, 226 OHMS, 1%, 1/8W	705-0965-000		81349	RH5502260F	U35	NOT USED				
R6	RESISTOR,FXD FILM, 1.91K, 1%, 1/8W	705-3605-130		81349	RH5501911F	U36	RESISTOR NETWORK 220K, 5%, 1.25W PKG	350-4030-010		01101	316A224
R7	RESISTOR,VAR 200 OHMS, 20%, 1/2W	382-0038-020		91637	101T200R0	U37	INTEGRATED CKT	351-1271-010		27014	LM317T
R8	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS	U38	INTEGRATED CKT	351-1527-060		34335	SN74LS193N
R9	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS	U39	INTEGRATED CKT	351-1948-010		01295	SN74LS190N
R10	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/4W	745-0776-000		81349	RCR07G562KS	U40	INTEGRATED CKT	351-8159-040		04713	MC14011UBCP
R11	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR07G153KS	VR1,VR2	NOT USED				
R12	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS	VR3	SEMICONV DEVICE	353-2724-000		81483	1N75EA
R13	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR07G153KS	VR4	SEMICONV DEVICE	922-6095-200		96341	1N5148A
R14	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/4W	745-0776-000		81349	RCR07G562KS	VR5	SEMICONV DEVICE	353-3591-490		04713	1N4625
R15	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS						
R16	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS						
R17	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RCR07G680KS						
R18	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/4W	745-0776-000		81349	RCR07G562KS						
R19	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS						
R20	RESISTOR,FXD CHPSN, 33 OHMS, 10%, 1/4W	745-0695-000		81349	RCR07G330KS						
R21	RESISTOR,FXD FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RH5501472F						
R22	RESISTOR,FXD FILM, 31.6K, 1%, 1/8W	705-1068-000		81349	RH5503162F						
R23	RESISTOR,FXD FILM, 46.4K, 1%, 1/8W	705-1076-000		81349	RH5504642F						
R24	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G473KS						
R25	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/4W	745-0770-000		81349	RCR07G392KS						
R26	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS						
R27	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/4W	745-0722-000		81349	RCR07G181KS						
R28	RESISTOR,FXD FILM, 169 OHMS, 1%, 1/2W	705-7059-000		81349	RH6501690F						
R29	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS						
R30	RESISTOR,VAR 1K, 20%, 1/2W	382-0038-040		91637	101T10000						
R31	RESISTOR,FXD CHPSN, 27K, 10%, 1/4W	745-0800-000		81349	RCR07G273KS						
R32	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G473KS						
R33	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR07G153KS						
R34	RESISTOR,FXD CHPSN, 12K, 10%, 1/4W	745-0788-000		81349	RCR07G123KS						
R35	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS						



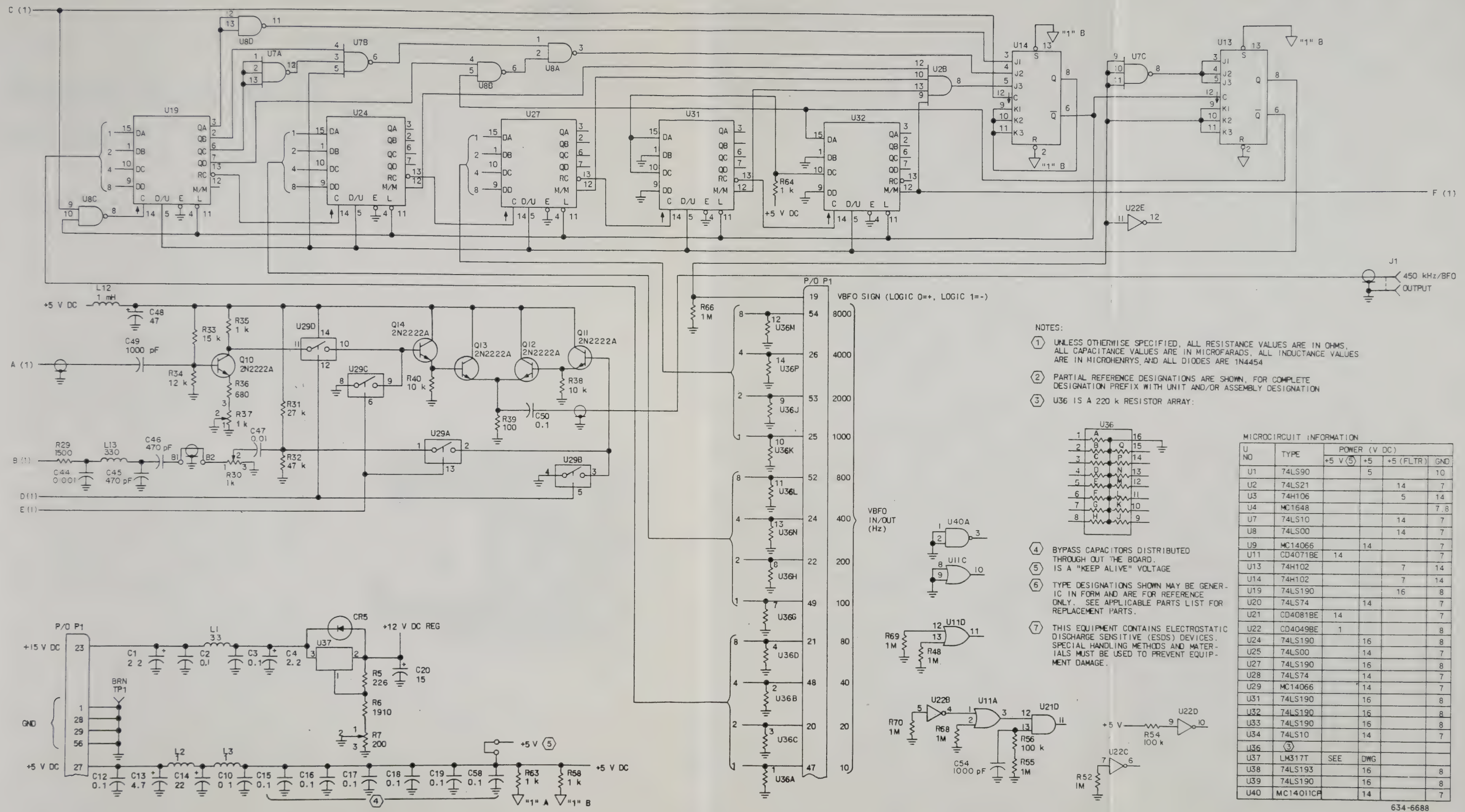
634-6688

VBFO, Schematic Diagram
Figure 4 (Sheet 3)



634-6688

VBFO, Schematic Diagram
Figure 4 (Sheet 4)



VBFO, Schematic Diagram
Figure 4 (Sheet 4)



Rockwell
International

instructions

Collins Telecommunications Products Division

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1 January 1981

Channel B1/A2/B2 IF (638-6975-())

Printed in USA

1. DESCRIPTION

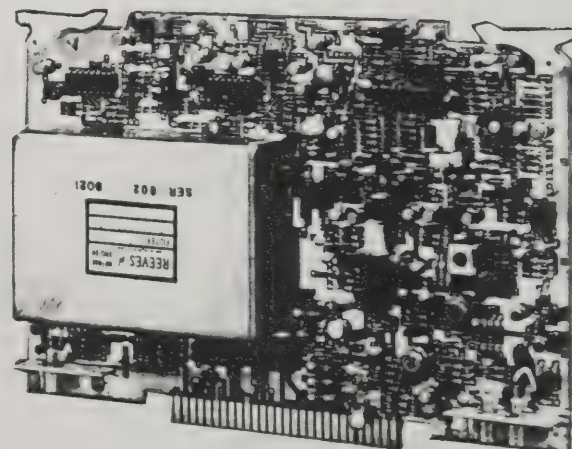
Channel B1/A2/B2 IF, 638-6975-(), shown in figure 1, is a 2-layer planar card with a 56-pin, edge-on connector (2 layers, 28 pins each) and three subminiature rf connectors. The 56-pin connector (P4) is for all signals to or from the card except i.f. input (P1), i.f. output (P6), and 450-kHz injection (P5, for the SSB product detector).

The channel B1/A2/B2 i.f. card consists of i.f. amplifier, product detector, and AGC circuits. Differences between the circuit cards are in the i.f. sideband and AGC time constants. The filter passband is 2.85 kHz at the 1-dB points. Center frequencies are LSB, 448.325 kHz; LLSB, 445.385 kHz; and USSB, 454.615 kHz. (The USB filter is on circuit card 638-6871-001, -002.) AGC time constants for the applicable AGC switch position are:

FAST	10 ms attack, 15 - 30 ms decay
MED	10 ms attack, 70 - 150 ms decay
SLOW	10 ms attack, 1 - 2 s decay
VOICE	10 ms attack, 1 - 2 s decay
DATA	10 ms attack, 15 - 30 ms decay
FAX	1.5 $\pm$ 0.5 s attack, 3 - 6 s decay

The card configuration differences are as follows:

- 638-6975-001 LSB filter, VOICE-DATA-FAX time constants, and end-of-message signal AGC crowbar.



TPA 3077-017

Channel B1/A2/B2 IF
Figure 1

- 638-6975-002 USSB filter and VOICE-DATA-FAX time constants.
- 638-6975-003 LLSB filter and VOICE-DATA-FAX time constants.
- 638-6975-004 LSB filter, FAST-MED-SLOW time constants, and end-of-message signal AGC crowbar.

- e. 638-6975-005 UUSB filter and FAST-MED-SLOW time constants.
- f. 638-6975-006 LLSB filter and FAST-MED-SLOW time constants.

2. PRINCIPLES OF OPERATION

2.1 General

The channel B1/A2/B2 i.f. card receives i.f., 450-kHz injection, and control signals and develops the following outputs:

- a. 450-kHz receive i.f.
- b. Product-detected channel SSB audio
- c. AGC signals
- d. Performance monitor signals
- e. Front panel meter AGC and receive-signal-strength signals

2.2 IF and AF Signals (Refer to figure 2.)

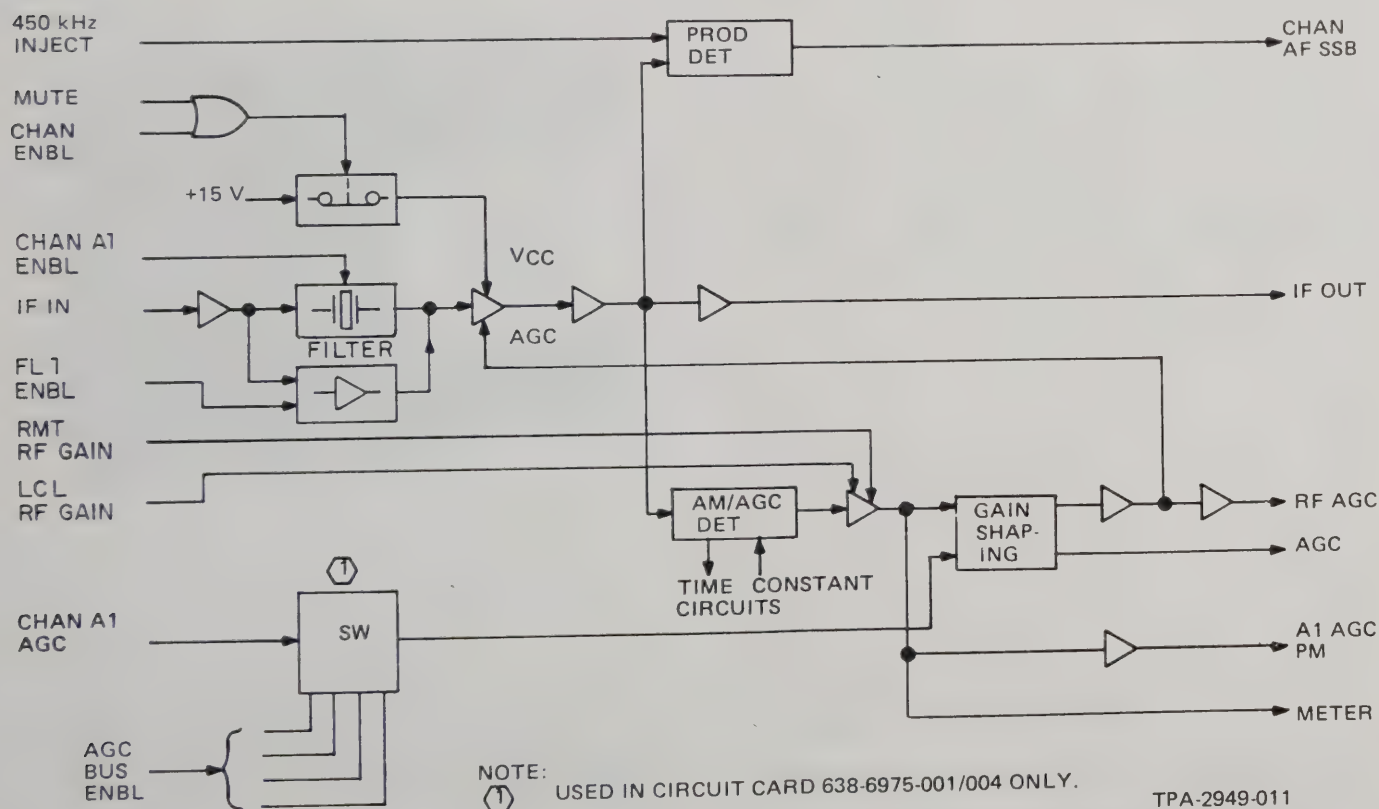
The 450-kHz i.f. signal is applied to gain-controlled amplifier stages through crystal filter FL1 if the CH A1 enable switch is ON or through amplifier Q10 if

FL1 is enabled. The filter center frequency is different for each of the circuit card configurations and depends on the sideband of operation. The amplifier stages have switched collector voltages. Voltage presence is inhibited by the MUTE or enabled by the CHAN ENBL input.

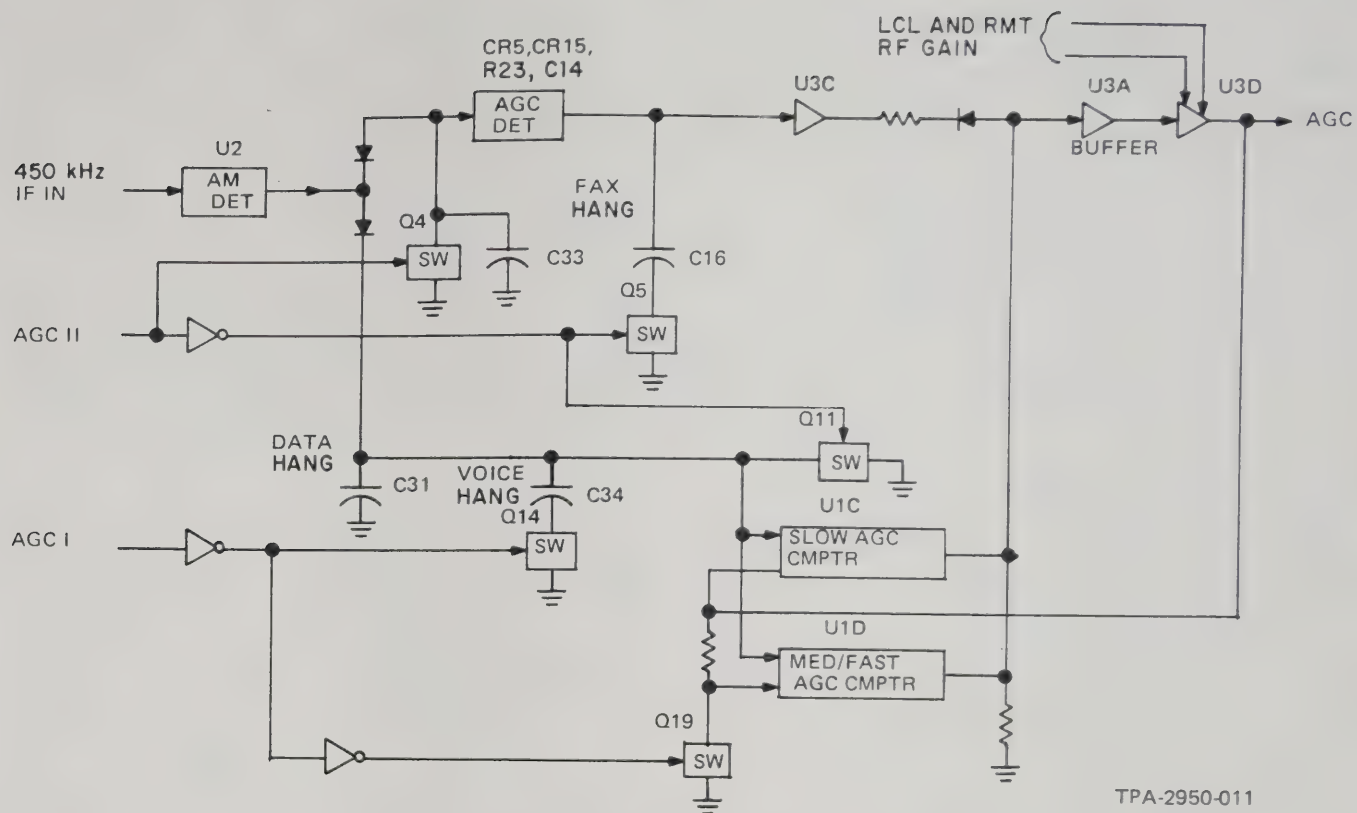
The amplified i.f. signal is applied to a product detector, AGC detector, and additional amplifiers. A 450-kHz injection signal is applied to the product detector for detecting the audio in the i.f. signal. This audio signal and the amplified i.f. signal are applied to other circuit cards as channel B1, A2, or B2 signals, depending on the i.f. filter used.

2.3 AGC Signals (Refer to figures 3 and 4.)

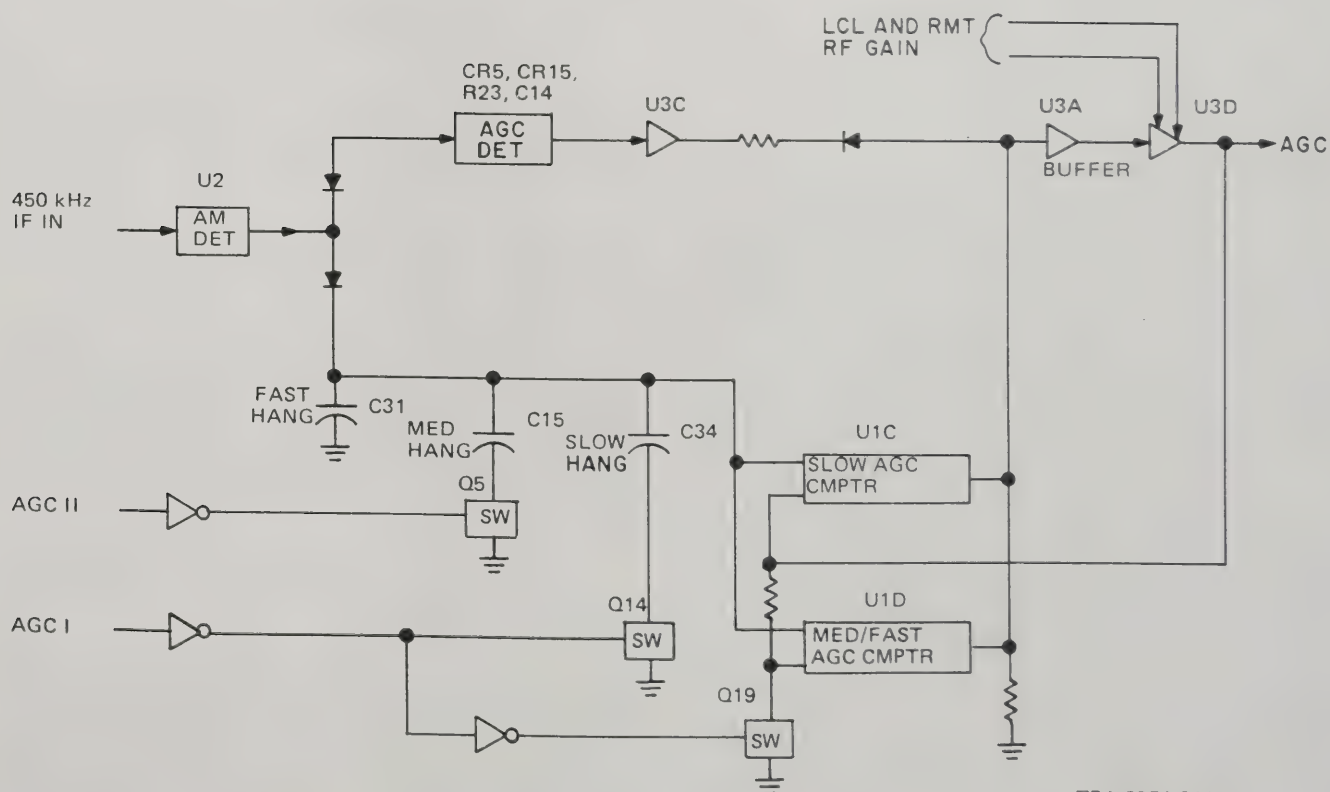
The i.f. signal is applied to an AM detector. The AM detector output is applied to an AGC detector and to the AGC circuits. AGC signals are developed through rc time constants selected by the receiver AGC switch. The AGC I and AGC II inputs to the AGC circuits control the time constant selection. Table 1 lists the logic levels associated with the receiver AGC switch positions.



IF and AGC Signal Paths
Figure 2



AGC Time Constant Circuit for 638-6975-001/002/003
Figure 3



AGC Time Constant Circuit for 638-6975-004/005/006
Figure 4

Table 1. AGC I and AGC II Logic Levels.

AGC		SWITCH POSITION	
I	II		
1	1	OFF	OFF
0	0	FAST	DATA
0	1	MED	FAX
1	0	SLOW	VOICE

The AGC I signal controls the slow or voice time constant. The AGC II signal controls the fast or data and medium or fax time constants. For the 638-6975-001 through -003 circuit cards, the AGC II signal grounds capacitors in the AGC detector circuit and grounds the AM detector output applied to the AGC comparator circuits. For the 638-6975-004 through -006 circuit cards, the AGC II signal grounds a capacitor in the AGC detector output. This enables the medium or fax time constant capacitor in the AGC hang circuit. The AGC I signal selects the appropriate AGC comparator and the slow or voice time constant capacitor in both circuit card configurations. (The differences are illustrated in figures 3 and 4.)

The selected (enabled) AGC comparator inputs are the AM detector output, modified by the selected hang time constant capacitor, and the AGC output from U3D. The comparator output, an AGC analog voltage, is applied through buffer amplifier U3A to amplifier U3D. This amplifier is gain-controlled by the local or remote rf gain signal. The amplifier output is used as a performance monitor and received-signal-strength signal and is also applied to a gain shaping circuit. The gain shaping amplifier keeps the AGC signal linear with respect to the received-signal strength. Output from this amplifier is fed back as the i.f. amplifier AGC, and output as the AGC signal to other circuit cards.

In the 638-6975-001 and -004 (LSB) circuit cards, a switching network applies the CH A1 AGC (USB) signal to the gain shaping amplifier. This occurs when the channel A1 and any other channel AGC bus is enabled. Since both the LSB and USB i.f. AGC signals are input to the amplifier, the higher level signal will control the amplifier output. Thus, the channel A1 (USB) i.f. AGC may control the channel B1 (LSB) i.f. AGC as well as other following circuits that use the AGC output from the 638-6975-001 or -004 circuit card.

2.4 AGC Crowbar (Refer to figures 5 and 13.)

The AGC crowbar circuits discharge the AGC capacitors when the i.f. signal level drops below about three volts or, in the 638-6975-001 and -004 (LSB) cards, when the END OF MSG signal (in NET DATA mode) is applied. This permits the i.f. amplifier to operate at maximum gain for weak receive signals.

When the i.f. signal drops below the reference voltage level at U1B, the comparator output goes positive to gate on Q7 to discharge AGC capacitors C21 and C80, Q5 to ground the AGC preamplifier input, and Q30 to ground inputs to the AGC comparators. This causes the AGC signal to go to zero, allowing maximum i.f. amplifier gain.

The 638-6975-001 and -004 cards have an additional crowbar trigger circuit. When the receiver is in the NET DATA mode, a logic 0 is applied to the junction of CR31, CR32, and the inverting input of U6B. (Refer to the schematic diagram figure 13.) The momentary END OF MSG pulse places a logic 1 at this junction. The resulting logic 0 output pulse is applied to AGC crowbar comparator U1B, inverting input. The positive output pulse from U1B momentarily gates on Q7, Q5, and Q30 to cause the AGC time constant capacitors to discharge. This permits the next net data message to be applied at full i.f. amplifier gain.

2.5 Differential Output Operational Amplifier 351-1050-030 (Refer to figure 6.)

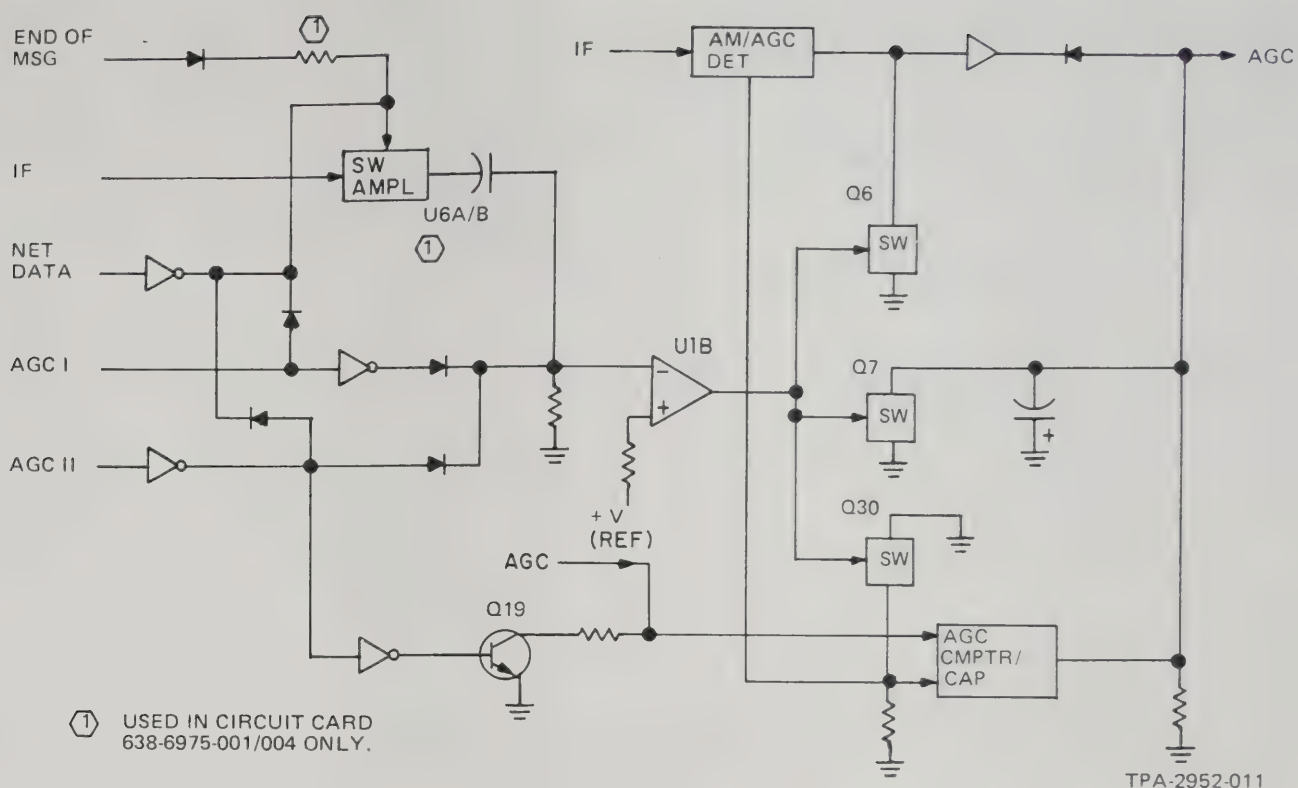
The 351-1050-030 is a wide-band general-purpose operational amplifier which features both differential inputs and outputs. Open loop gain is adjustable with external feedback components.

2.6 Quad Operational Amplifier 351-1141-030 (Refer to figure 7.)

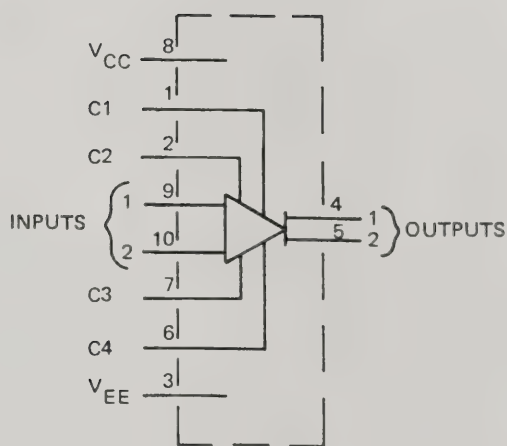
The 351-1141-030 consists of four independent, high-gain, internally frequency-compensated operational amplifiers that are designed to operate from a single power supply over a wide range of voltages. Common applications include transducer amplifiers, dc gain blocks, and all conventional operational amplifier circuits.

2.7 Quad Operational Amplifier 351-1370-020 (Refer to figure 8.)

The 351-1370-020 consists of four independent, high-speed operational amplifiers with internally-adjusted input offset voltage. The amplifiers have low noise and offset voltage drift. Common applications include high-speed integrators, sample-and-hold circuits, and d/a converters.



AGC Crowbar Circuit
Figure 5



CHARACTERISTICS

SUPPLY VOLTAGE: V_{CC} +8 V DC MAX.,
 V_{EE} -8 V DC MAX.

INPUT DIFF VOLTAGE: ± 8 V DC MAX.

INPUT COMMON MODE VOLTAGE:
 ± 3.0 V PEAK

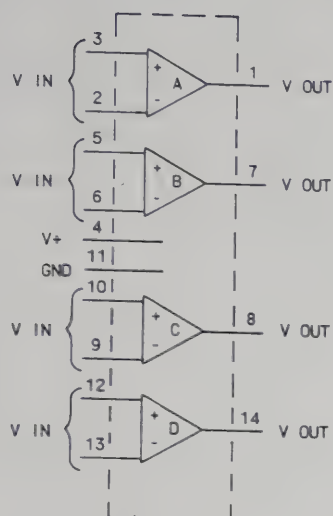
INPUT RESISTANCE: 2.0 M OHM TYPICAL

OUTPUT RESISTANCE: 50 OHM TYPICAL

OPEN LOOP GAIN: SINGLE ENDED—
750 V/V MIN, 1500 V/V TYPICAL;
DIFFERENTIAL — 1500 V/V MIN.,
3000 V/V TYPICAL

BANDWIDTH: OPEN LOOP—2.0 MHz TYPICAL;
CLOSED LOOP —10.0 MHz TYPICAL

Differential Output Operational Amplifier 351-1050-030
Figure 6



CHARACTERISTICS

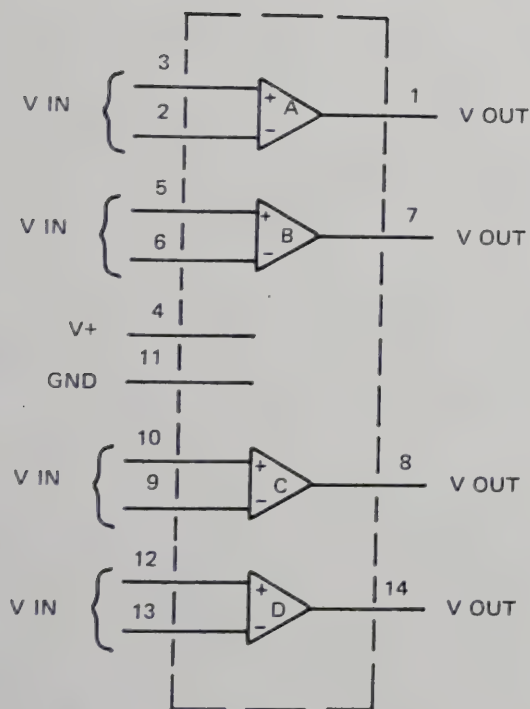
SUPPLY VOLTAGE (V+): 32 V DC MAX
 INPUT DIFF VOLTAGE: 32 V DC MAX
 INPUT COMMON MODE VOLTAGE: V+ (-1.5 V DC)
 OUTPUT SHORT CIRCUIT DURATION:
 CONTINUOUS (1)
 VOLTAGE GAIN: 25 MIN

NOTE:

(1) SUPPLY VOLTAGE EQUAL TO OR LESS THAN 15 V.

TP5-2289-013

Quad Operational Amplifier 351-1140-030
 Figure 7



CHARACTERISTICS

SUPPLY VOLTAGE (V+): 18 V DC MAX
 INPUT DIFF VOLTAGE: 30 V DC MAX
 OUTPUT SHORT CIRCUIT DURATION:
 CONTINUOUS (1)
 VOLTAGE GAIN: 50 MIN

NOTE:

(1) POWER DISSIPATION OF 500 mW CANNOT BE EXCEEDED.

TPA-2899-011

Quad Operational Amplifier 351-1370-020
 Figure 8

2.8 Balanced Modulator-Demodulator 351-0043-020 (Refer to figure 9.)

The 351-0043-020 is designed for use where the output voltage is a product of an input voltage (signal) and a switching function carrier. Typical applications include suppressed carrier and amplitude modulation, synchronous detection, FM detection, phase detection, and chopper applications.

2.9 Dual Comparator 351-1166-010 (Refer to figure 10.)

The 351-1166-010 consists of two independent comparators. Each is high speed, requires low input current, and has an open-collector output. The comparators are compatible with RTL, DTL, and TTL, and capable of handling up to 25 mA at the output.

2.10 Quad Voltage Level Shifter 351-8458-010 (Refer to figure 11.)

The 351-8458-010 consists of four voltage level-shifting circuits operating as low-to-high voltage level shifters. A low-voltage input at pin 3, 6, 10, or 14 will

be output as a high voltage (equivalent to pin 16) at pin 4, 5, 11, or 13, respectively, when the appropriate enable input (pin 2, 7, 9, or 15) is at logic 1. A logic 0 on the enable input causes a high-impedance output regardless of the input voltage. If the voltage at pin 1 is greater than that at pin 16, the 351-8458-010 operates as a high-to-low-voltage level shifter.

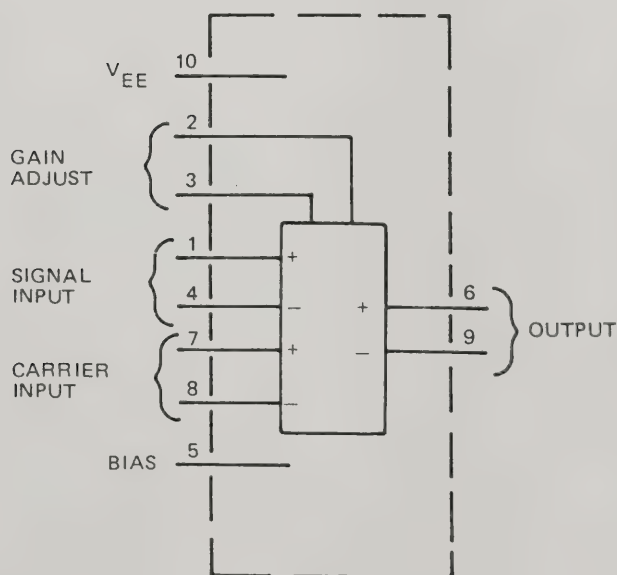
2.11 COS/MOS Quad Bilateral Switch 351-8252-010 (Refer to figure 12.)

The 351-8252-010 consists of four bilateral switches in one package. The 351-8252-010 bilateral switches exhibit a low closed-switch impedance (60 to 360 ohms, typical) and relative constant impedance (± 5 ohms) over the full input signal range.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the channel B1/A2/B2 i.f. card are listed in the maintenance section of this instruction book.



CHARACTERISTICS

APPLIED VOLTAGE: 30 V DC MAX PIN-TO-IN.

DIFFERENTIAL INPUT VOLTAGE: ± 5 V DC MAX

CARRIER SUPPRESSION: 65 dB TYPICAL AT 0.5 MHz; 50 dB TYPICAL AT 10 MHz.

TRANSADMITTANCE BANDWIDTH:
CARRIER INPUT-300 MHz TYPICAL;
SIGNAL INPUT-80 MHz TYPICAL

SINGLE-ENDED INPUT RESISTANCE (SIGNAL INPUT): 200 k OHM TYPICAL (AT 5.0 MHz)

SINGLE-ENDED INPUT RESISTANCE (SIGNAL INPUT): 40 k OHM TYPICAL (AT 10 MHz)

DIFFERENTIAL OUTPUT VOLTAGE SWING:
8.0 V P-P TYPICAL

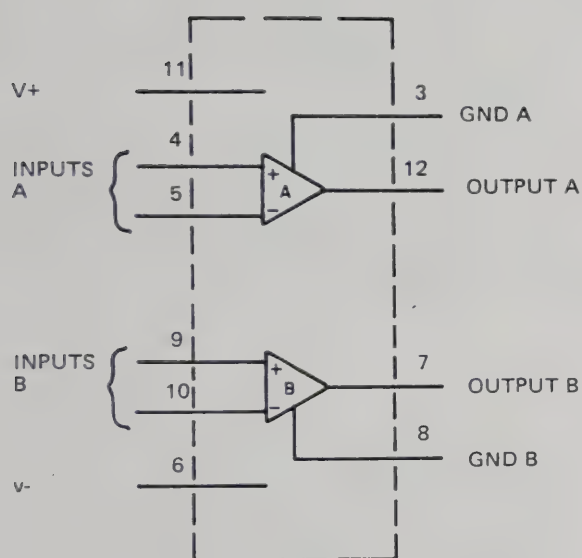
TP5-2291-011

Balanced Modulator-Demodulator 351-0043-020
Figure 9

3.2 Testing

Test procedures in table 2 check total performance of the channel B1/A2/B2 i.f. card. These test procedures

permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

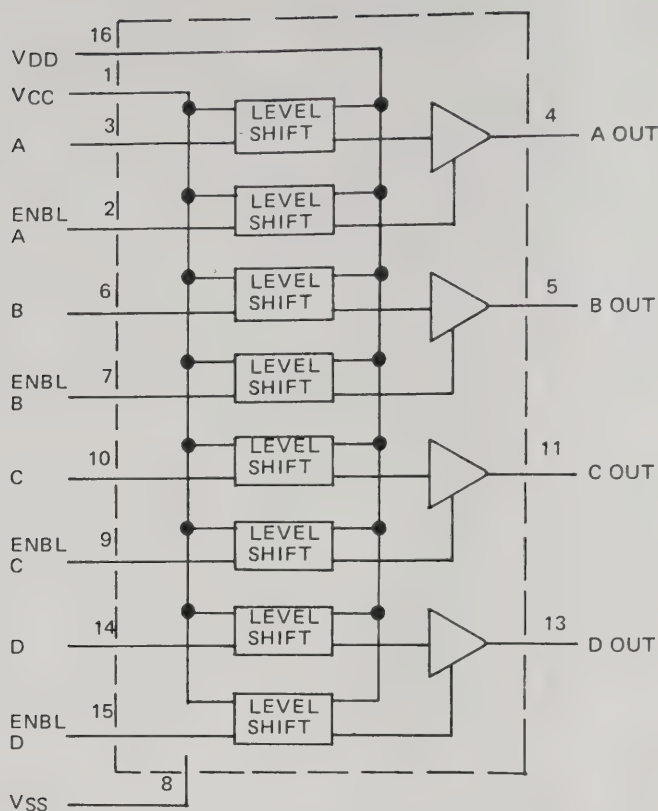


CHARACTERISTICS

SUPPLY VOLTAGE: V+ +18 V MAX;
 V- -25 V MAX; 36 V MAX TOTAL
 POWER DISSIPATION: 500 mW MAX
 INPUT DIFF VOLTAGE: ± 5 V MAX
 OUTPUT SHORT CIRCUIT DURATION:
 10 SECONDS MAX
 VOLTAGE GAIN: 10 MIN.

TPA-2900-011

Dual Comparator 351-1166-010
 Figure 10

**CHARACTERISTICS:**

SUPPLY VOLTAGE (V_{CC} , V_{DD} REFERENCED TO V_{SS}): +20 V MAX
 INPUT VOLTAGE (ALL INPUTS): +20 V MAX
 INPUT CURRENT, ANY ONE INPUT: ± 10 mA DC MAX
 POWER DISSIPATION (TOTAL): 500 mW TO +60°C,
 200 mW +60 TO +85°C; MAX

TRUTH TABLE (LOW-TO-HIGH LEVEL SHIFT)

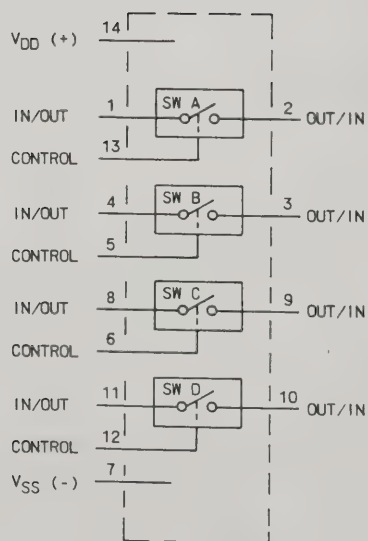
INPUT		OUTPUT A,B,C,D
A,B,C,D	ENBL A,B,C,D	
0	1	0
1	1	1
X	0	HI Z

X=DON'T CARE
 0= V_{SS} VOLTAGE
 1= V_{CC} AT INPUTS; V_{DD} AT OUTPUTS

TPA-2898-011

Quad Voltage Level Shifter 351-8458-010

Figure 11

**TYPICAL CHARACTERISTICS**

V_{DD} TO V_{SS} VOLTS	CONTROL VOLTS	CLOSED-SWITCH IMPEDANCE		TYPICAL OPEN- SWITCH IMPEDANCE
		TYPICAL	MAX	
15	15	60-145 Ω	220-320 Ω	10 k Ω
10	10	89-190 Ω	400-550 Ω	10 k Ω
5	5	160-360 Ω	3000-5500 Ω	10 k Ω

NOTE: CONTROL VOLTAGE MUST EQUAL V_{DD} TO CLOSE SWITCH.
 CONTROL VOLTAGE MUST EQUAL V_{SS} TO OPEN SWITCH.

TP5-2283-013

COS/MOD Quad Bilateral Switch 351-8252-010

Figure 12

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
	Note Front panel control settings (at the beginning of each test) are listed only for those controls where settings affect the test. Unlisted controls may be set in any position.		
1. Setup	a. Remove top cover of unit. b. Remove channel B1/A2/B2 i.f. card, as applicable. Install it on extender card and place extender card in unit. Connect coax extender cables between card connectors P5 and P6 and unit. Connect coax extender cable between P1 and rf sig gen (through 6-dB attenuator). c. Set unit LINE SELECTOR switch to 115 V. Ensure that fuse is 2 A. d. Connect unit to 115-V ac power source and set PWR on. e. Measure dc voltages on card between following pins and ground: P1-23 P1-51 P1-6 P1-27	+15.0 $\pm$1.0 V dc +15.0 $\pm$1.0 V dc -15.0 $\pm$1.0 V dc +5.0 $\pm$0.5 V dc	Check associated power supply.
2. Channel enable	a. Set CH B1/A2/B2 switch, as applicable, to OFF. b. Measure dc voltage between TP2 (red) and ground. c. Set CH B1/A2/B2 switch, as applicable, to ON. d. Measure dc voltage between TP2 (red) and ground. e. On rear panel of unit, temporarily ground MUTE terminal (TB1-10). f. Measure dc voltage between TP2 (red) and ground. g. Remove ground from MUTE.	Not more than 0.5 V dc Not less than +12 V dc Not more than +0.5 V dc	Check U1A, Q1, and associated components. Check U1A, Q1, and associated components. Check U1A, Q1, and associated components.
3. I.f. sensitivity and gain (Cont)	a. Set all AGC switches OFF, MODE to ISB, and RF GAIN to max cw. Set CH B1/A2/B2, as applicable, ON and others OFF.		

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL						
3. (Cont)	b. Set sig gen output to 5 μV (as shown on sig gen meter) and frequency as shown for i.f. card being tested. Note If HP 8640B sig gen is used, apply -9.0 V to FM INPUT and set FM to DC. This permits the sig gen frequency to be tuned lower than the normal limit. <table><tr><td>638-6975-001, -004</td><td>448.325 kHz</td></tr><tr><td>638-6975-002, -005</td><td>454.615 kHz</td></tr><tr><td>638-6975-003, -006</td><td>445.385 kHz</td></tr></table> c. Connect distortion analyzer input to applicable channel AF OUT (between balanced-output terminals) on rear panel. Connect 600-ohm resistor between same two terminals. d. Set reference level on distortion analyzer. e. Set analyzer mode to distortion and measure sensitivity of i.f. amplifier. f. Connect rf voltmeter through 50-ohm adapter to applicable channel IF connector on rear panel. g. Set sig gen output level to 90 μV (as shown on sig gen meter) and frequency to near center of filter passband (listed in step b). h. Set applicable channel AGC to FAST or DATA. i. Measure i.f. output level. I.F. SENSITIVITY AND GAIN TESTING COMPLETE	638-6975-001, -004	448.325 kHz	638-6975-002, -005	454.615 kHz	638-6975-003, -006	445.385 kHz		
638-6975-001, -004	448.325 kHz								
638-6975-002, -005	454.615 kHz								
638-6975-003, -006	445.385 kHz								
		Not less than 10 dB	Proceed to step j.						
		22 $\pm$ 5 mV	Proceed to step m.						
	TROUBLESHOOTING								
	j. Connect rf voltmeter through 50-ohm adapter to applicable channel IF connector on rear panel. k. Set sig gen output level to obtain approx 25-mV output at IF connector. l. Adjust L7 for peak output at IF connector.	Max output level	If signal not adjustable or not present, signal trace to find malfunctioning stage.						
(Cont)									

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																					
3. (Cont)	m. Set sig gen output level to 28 μV. Record V dc at P4-21. n. Reduce sig gen output to 9 μV. Monitor dc V at P4-21 (AGC) while adjusting R99 to obtain 0.85 V dc. o. Increase sig gen output to 28 mV. p. Adjust R55 to obtain +5.0 V dc at P4-21.		If R99 does not control voltage, check Q22/Q23, Q24, Q25/Q26, and associated circuits. If R55 does not allow voltage to be properly adjusted, perform AGC tests, then repeat test 3.																					
4. I.f. selectivity	a. Refer to test 3 and perform equipment setup given in steps a through g. b. Set distortion analyzer to audio voltmeter mode. c. Set sig gen output level for 10-mV audio output and frequency to applicable center frequency of circuit card being tested. <table><tr><td>638-6975-001, -004</td><td>448.325 kHz</td></tr><tr><td>638-6975-002, -005</td><td>454.615 kHz</td></tr><tr><td>638-6975-003, -006</td><td>445.385 kHz</td></tr></table> d. Adjust distortion analyzer for 0-dB reference level. e. Adjust sig gen frequency above and below center frequency listed for applicable card until voltmeter indication is 1 dB below 0 dB. Note frequencies (in kHz).	638-6975-001, -004	448.325 kHz	638-6975-002, -005	454.615 kHz	638-6975-003, -006	445.385 kHz	<table><tr><th>CARD PART NO ENDING</th><th>MAX LOW FREQ</th><th>MIN HIGH FREQ</th></tr><tr><td>-001</td><td rowspan="2">446.90</td><td rowspan="2">449.75</td></tr><tr><td>-004</td></tr><tr><td>-002</td><td rowspan="2">453.19</td><td rowspan="2">456.04</td></tr><tr><td>-005</td></tr><tr><td>-003</td><td rowspan="2">443.96</td><td rowspan="2">446.81</td></tr><tr><td>-006</td></tr></table>	CARD PART NO ENDING	MAX LOW FREQ	MIN HIGH FREQ	-001	446.90	449.75	-004	-002	453.19	456.04	-005	-003	443.96	446.81	-006	Check filter FL1.
638-6975-001, -004	448.325 kHz																							
638-6975-002, -005	454.615 kHz																							
638-6975-003, -006	445.385 kHz																							
CARD PART NO ENDING	MAX LOW FREQ	MIN HIGH FREQ																						
-001	446.90	449.75																						
-004																								
-002	453.19	456.04																						
-005																								
-003	443.96	446.81																						
-006																								

(Cont)

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION			IF INDICATION IS ABNORMAL
4. (Cont)	f. Set sig gen frequency to applicable center frequency of circuit card. Increase sig gen output level 60 dB greater than that set in step c. g. Adjust distortion analyzer for 0-dB reference level. h. Adjust sig gen frequency above and below center frequency listed for applicable card until voltmeter indication is 1 dB below 0 dB. Note frequencies (in kHz).				Check filter FL1.
		CARD PART NO ENDING	MIN LOW FREQ	MAX HIGH FREQ	
		-001	446.45	450.25	
		-004			
		-002	452.74	456.54	
		-005			
		-003	443.46	447.26	
		-006			
5. Audio output	a. Connect channel A1 i.f. card J1 to sig gen through 6-dB attenuator. b. Set sig gen frequency as shown for i.f. card being tested. 638-6975-001, -004 449 kHz 638-6975-002, -005 455 kHz 638-6975-003, -006 445 kHz c. Set sig gen output to 90 μV. d. Set applicable channel AGC to FAST or DATA and RF GAIN to max cw position. e. Temporarily connect 600-ohm resistor and audio voltmeter between P4-34 and ground. f. Measure audio output at P4-34.	10 mV ac			Adjust R142 to obtain 10 mV. If R142 does not control signal, check P5 for 450 kHz at 7 ±1 dB mW. Check Q27, Q28, U5, and associated components.
(Cont)					

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	g. Disconnect setup from P4-34.		
6. AGC output voltage	a. Refer to test 3 and perform equipment setup given in steps a through e. b. Set applicable channel AGC to FAST or DATA. c. Set sig gen output level to 280 μV. d. Measure voltage at P4-21. e. Set sig gen output level to 28 mV. f. Measure voltage at P4-21. g. Measure voltage at P24-18.	+0.90 $\pm$0.2 V dc +5.0 $\pm$0.1 V dc +3.0 $\pm$0.1 V dc (Voltage at P4-21 should be 5.0 V. Adjust RF GAIN to obtain +5 V if necessary.)	Adjust R99 as necessary. If R99 adjusted, perform test 3. If R99 does not adjust level, check U1, U2, U3, and associated components. Check U3A/C/D, Q9, Q10, and associated components. Adjust R57 as necessary. If R57 does not adjust level, check Q12/Q13 and associated components. If necessary, replace R56 with test select value of 820 Ω, 1000 Ω, 1200 Ω, 1500 Ω, or 1800 Ω.
7. AGC time constants	a. Disconnect sig gen and 6-dB attenuator from i.f. card. Connect sig gen and 6-dB attenuator to signal input of rf signal level switch. Connect switch output to P1 on i.f. card. b. Connect 30 dB of attenuation to rf signal level switch attenuator connectors. c. Connect scope trigger to rf signal level switch trigger output. Connect scope vertical input to applicable channel i.f. output connector on rear panel. d. Apply dc voltage (+15 to +28 V) to rf signal level switch.		
(Cont)	e. Set sig gen output level to 2.7 mV.		

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

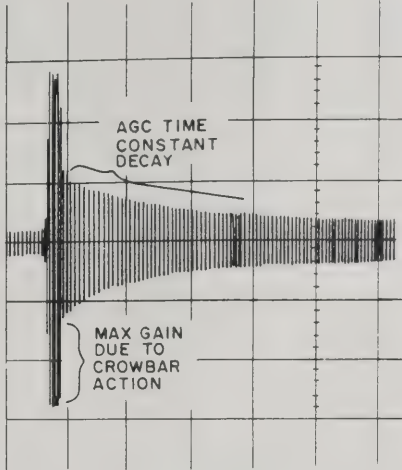
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)	f. While observing scope, depress and release level switch and measure AGC attack and decay times.  SIGNAL RESPONSE INCLUDING CROWBAR ACTION TPA - 3068 - 011	As indicated for applicable card:	Proceed to step h.
		638-6975-001, -002, -003	
		AGC TC	*ATTACK DECAY
		DATA	10 ms max 15 to 30 ms
		VOICE	10 ms max 1 to 2.2 s
		FAX	2 s max 3 to 10 s
		638-6975-004, -005, -006	
		AGC TC	*ATTACK DECAY
		FAST	10 ms max 15 to 30 ms
		SLOW	10 ms max 1 to 2.2 s
		MED	10 ms max 70 to 150 ms
		*Measured when signal is within 3 dB of steady state level.	
	g. Set unit AGC time constant switch to other positions, repeating step f for each position. AGC TIME CONSTANTS TESTING COMPLETE		
(Cont)	----- TROUBLESHOOTING h. To adjust decay time, perform steps i through l. If rise time faulty, go to step m. i. Set sig gen output level to 900 μV. Adjust rf signal level switch attenuator for 4 dB of attenuation. j. Connect scope vertical input to U1-14. k. Depress level switch and permit output to scope to stabilize. l. Observe scope and release level switch.	U1-14 just starts to switch positive toward end of sweep.	Adjust R74 as necessary. (When correctly adjusted, U1-14 will switch on 4-dB decrease but will not on 3-dB decrease.)

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

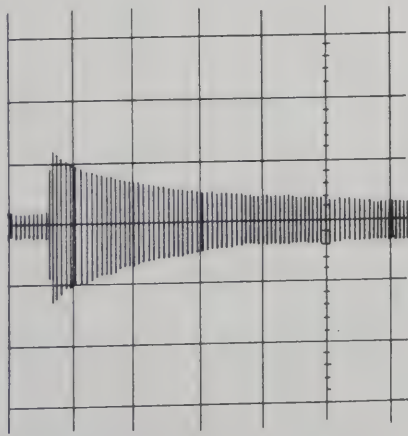
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)	m. No adjustable components are included for rise time. For all rise times other than FAX, check C14 and associated components. For FAX rise time malfunctions, check C16.		If R74 does not correct decay time and decay is incorrect for SLOW/VOICE time constant, check U4C, Q14, Q19, U1D, and associated components. If decay is incorrect for FAST/DATA or MED/FAX time constants, check U4A, Q11, Q5, U1C, and associated components.
8. AGC crowbar; applicable to 638-6975-001 and -004 only	a. Connect variable attenuator to rf signal level switch attenuator connectors. Set attenuation to 30 dB. b. Set sig gen output level to 28 mV and frequency to 9.449 MHz. c. Depress and release level switch and observe scope display for crowbar action.  SIGNAL RESPONSE WITHOUT CROWBAR ACTION TPA-3069-011		
(Cont)			

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	d. Decrease attenuation, then repeat step c. Continue until crowbar action no longer occurs. e. Note attenuation just before crowbar action ceases to occur. f. Set MODE to NET DATA and AGC to FAST or DATA. g. Observe scope while momentarily applying a +5-V logic 1 to P4-33, simulating an end-of-message signal. h. Set MODE to position other than NET DATA. i. Repeat step g. Note To check TADIL A crowbar operation, use the SA-1914/TSC-60(V) Radio Frequency Switching Unit. j. Set MODE to NET DATA, AGC to FAST or DATA, and RF GAIN to max cw position. k. Connect two sig gens to SA-1914 RF1 IN and RF2 IN. Set RF1 sig gen to 449 kHz and RF2 sig gen to 448 kHz. l. Connect SA-1914 RF OUT directly to channel B1 i.f. card P1. m. Connect SA-1914 TRIG OUT to scope trigger and scope vertical input to P4-34 (SSB AF output), or to channel B1 IF OUT jack on rear panel. n. Set SA-1914 MODE SELECTOR to RF2 OFF. o. Set RF1 sig gen output level to 28 mV and RF2 sig gen output level to 28 μV. p. Adjust scope so sweep is just below trigger threshold. (Sweep speed approx 0.5 s/div.)	20 $\pm$3 dB I.f. output momentarily limits as circuit crowbars. I.f. output does not limit.	Check U1B, Q7, and associated components. Check U6B, U1B, Q7, and associated components. Check U6B and associated components.
(Cont)			

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

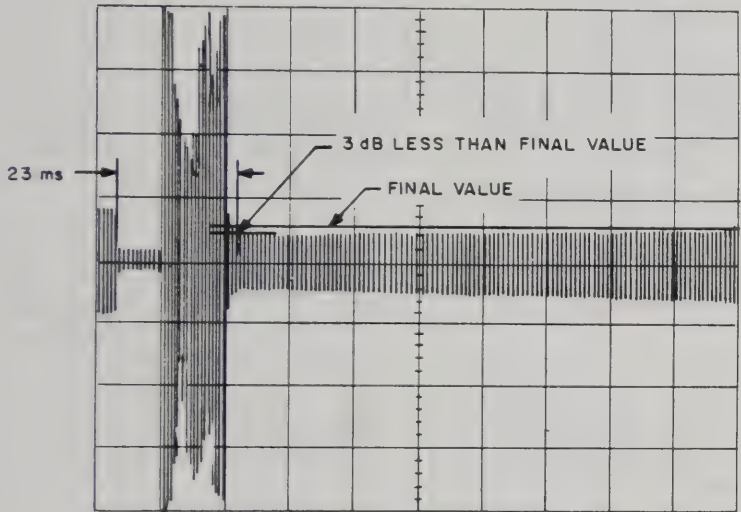
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	q. Set MODE SELECTOR to RF1 OFF and observe audio output on scope. r. Set both sig gen output levels to 10 mV.  TADIL A CROWBAR ACTION TPA-3070-011 s. Repeat step q. t. Disconnect test setup.	Audio output is within 3 dB of final level within 23 ms after sig gen rf out switched off.	
9. AGC bus switching; applicable to 638-6975-001 and -004 only (Cont)	a. Connect sig gen rf output (through 6-dB attenuator) to P1 on card. Set sig gen frequency to 449 kHz and output level to 100 μV. b. Set CH B1 enable to ON, CH B1 AGC to FAST, CH B1 AGC BUS to ON and all other AGC BUS switches to OFF. Set RF GAIN to max cw position. c. Measure dc voltage at P4-21. d. Turn on sig gen rf. e. Record voltage at P4-22. f. Set CH A1 AGC BUS to ON.	Not more than +1 V	Check for logic 0 at P4-7. If present, check U7 and U8.

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. (Cont)	g. Measure dc voltage at P4-24.	Voltage near that recorded in step e	Check for logic 1 at P4-7. If present, check U7 and U8.
	h. Set CH B1 AGC BUS to OFF and CH A2 AGC BUS to ON.		
	i. Measure dc voltage at P4-20.	Voltage near that recorded in step e	Check for logic 1 at P4-9. If present, check U7 and U8.
	j. Set CH A2 AGC BUS to OFF and CH B2 AGC BUS to ON.		
	k. Measure dc voltage at P4-19.	Voltage near that recorded in step e	Check for logic 1 at P4-10. If present, check U7 and U8.
10. AGC off	a. Set sig gen output to 28 mV. b. Connect scope to P4-34. c. Observe scope display and switch CH B1 AGC to OFF.	Signal level increases due to no AGC action.	Check U4A, U4B, and associated components.
11. AGC performance monitor (applicable to all cards)	a. Turn off sig gen rf output. b. Monitor dc voltage at TP1 (A1 AGC PM) and slowly decrease RF GAIN to point where voltage at TP1 goes to less than +1.0 V (logic 0). c. Measure AGC signal voltage at P4-21.	Not more than +0.8 V dc	Check Q2 and associated components.
12. Rf gain and meter bus	a. Turn off sig gen rf. b. Set AGC to OFF and RF GAIN to max ccw position. c. Check for +4.0 $\pm$ 0.5 V dc to P4-39. (Adjust RF GAIN, if necessary, to set voltage.) d. Measure dc V at P4-21. e. Adjust RF GAIN to obtain +4.0 V at P4-21.	Not less than +8 V dc	Check U3D and associated components.
(Cont)	f. Measure dc V at P4-12.	4 $\pm$ 0.2 V dc	Check CR10.

Table 2. Channel B1/A2/B2 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
12. (Cont)	Note Steps g thru i can be performed only if HF-8094() Remote Control is connected to HF-8054(). g. Set HF-8054() CONT to REM. h. Adjust HF-8094() RF GAIN to obtain -4.0 ± 0.5 V dc at HF-8054() P4-11. i. Measure dc V at HF-8054() P4-21. j. Tests completed. Turn off power. Disconnect all test equipment and reinstall circuit card in unit.	+3.9 $\pm$ 0.1 V dc	Check U3D and associated components.

4. ALIGNMENT/ADJUSTMENT

4.1 AGC Time Constant Decay (Adjustment of R74)

With no signal input to card, adjust R74 to produce +1.85 V at U1-10.

4.2 SSB Audio Output Level (Adjustment of R142)

- Apply 448 kHz if testing 638-6975-001, -004; 455 kHz if testing 638-6975-002, -005; or 445 kHz if testing 638-6975-003, -006; 280- μ V input to P1 of channel B1/A2/B2 i.f. card.
- Set MODE to ISB; AGC to ON; CH A1 to ON; CH B1 to ON if testing 638-6975-001, -004, CH A2 to ON if testing 638-6975-002, -005, or CH B2 to ON if testing 638-6975-003, -006; and RF GAIN to max cw position.
- Connect 600-ohm resistor and audio voltmeter between P4-34 and ground.
- Adjust R142 to product 120 mV rms at P1-34.

4.3 I.f. Amplifier Alignment (Alignment of L7)

- Set AGC to OFF; MODE to ISB; CH A1 to ON; CH B1 to ON if testing 638-6975-001, -004, CH A2 to ON if testing 638-6975-002, -005, or CH B2 to ON if testing 638-6975-003, -006; and RF GAIN to max cw position.
- Apply input of 488 kHz if testing 638-6975-001, -004; 455 kHz if testing 638-6975-002, -005; or 445 kHz if testing 638-6975-003, -006 to P1 at level sufficient to produce approx 25 mV rf at P6.
- Adjust L7 to obtain peak voltage at P6. (L7 has two adjustment peaks; either may be used.)

4.4 I.f. Amplifier and AGC Gain (Adjustment of R99 and R55)

- Apply 448 kHz if testing 638-6975-001, -004, 455 kHz if testing 638-6975-002, -005, or 445 kHz if testing 638-6975-003, -006; 280-mV input to P1 of channel A1 i.f. card.
- Set AGC to OFF; CH A1 to ON; CH B1 to ON if testing 638-6975-001, -004, CH A2 to ON if testing 638-6975-002, -005, or CH B2 to ON if testing 638-6975-003, -006; and MODE to ISB.
- Adjust R99 to produce +850 mV at P4-21.
- Increase sig gen output by 40 dB (to 28 mV).
- Adjust R55 to obtain +5.0 V at P4-21.
- Repeat steps a through e until no further adjustment is necessary.

- Disconnect sig gen from P1 of channel A1 i.f. card.
- Adjust RF GAIN to obtain $+5.00 \pm 0.05$ V at P4-21.
- Adjust R57 to obtain $+3.0 \pm 0.05$ V at P4-18.

5. REPAIR

Repair of the control card is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

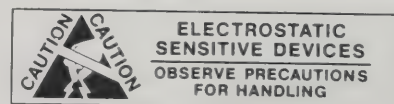
6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram. The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The description, Collins part number, usable on code, manufacture code and manufacturer's part number are listed for each reference designator.

6.2 Parts list

REF DES COLUMN — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column—Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column—Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column—Part variations within a group of equipment are indicated by a letter code (A, B, C, etc.). Absence of a code indicates part applies to all models.

MFR CODE Column—Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column—Lists the manufacturer's part number for the selected parts.

Listed below are manufacturer's names and addresses for the manufacturer's codes found in this parts list.

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
-------------	------------------------------------

00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
00872	TELEDYNE SYSTEMS CO MICROELECTRONICS DIV 12964 PANAMA ST LOS ANGELES CA 90066
02111	SPECTROL ELECTRONICS CORP SUB OF CARRIER CORP 17070 E GALE AVE CITY OF INDUSTRY CA 91745
02113	COILCRAFT INC 1102 SILVER LAKE RD CARY IL 60013
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021

MFR
CODE

MANUFACTURER'S NAME
AND ADDRESS

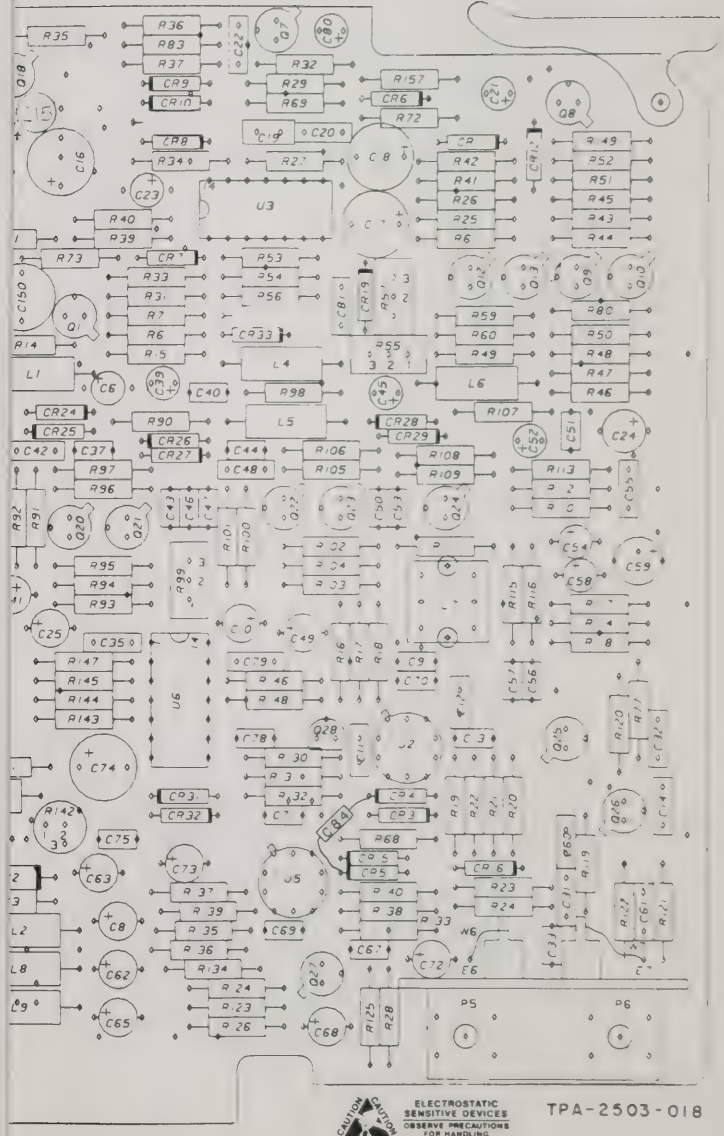
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
09021	AIRCO ELECTRONICS FOSTER BROOK RD P O BOX 334 BRADFORD PA 16701
12040	NATIONAL SEMICONDUCTOR CORP COMMERCE DR P O BOX 443 DANBURY CT 06810
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV PO BOX 728 855 35TH STREET NE CEDAR RAPIDS IA 52406
15818	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
28480	HEWLETT-PACKARD CO CORPORATE HQ 1501 PAGE MILL RD PALO ALTO CA 94304
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
80294	BOURNS INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544

6.3 Equipment Covered

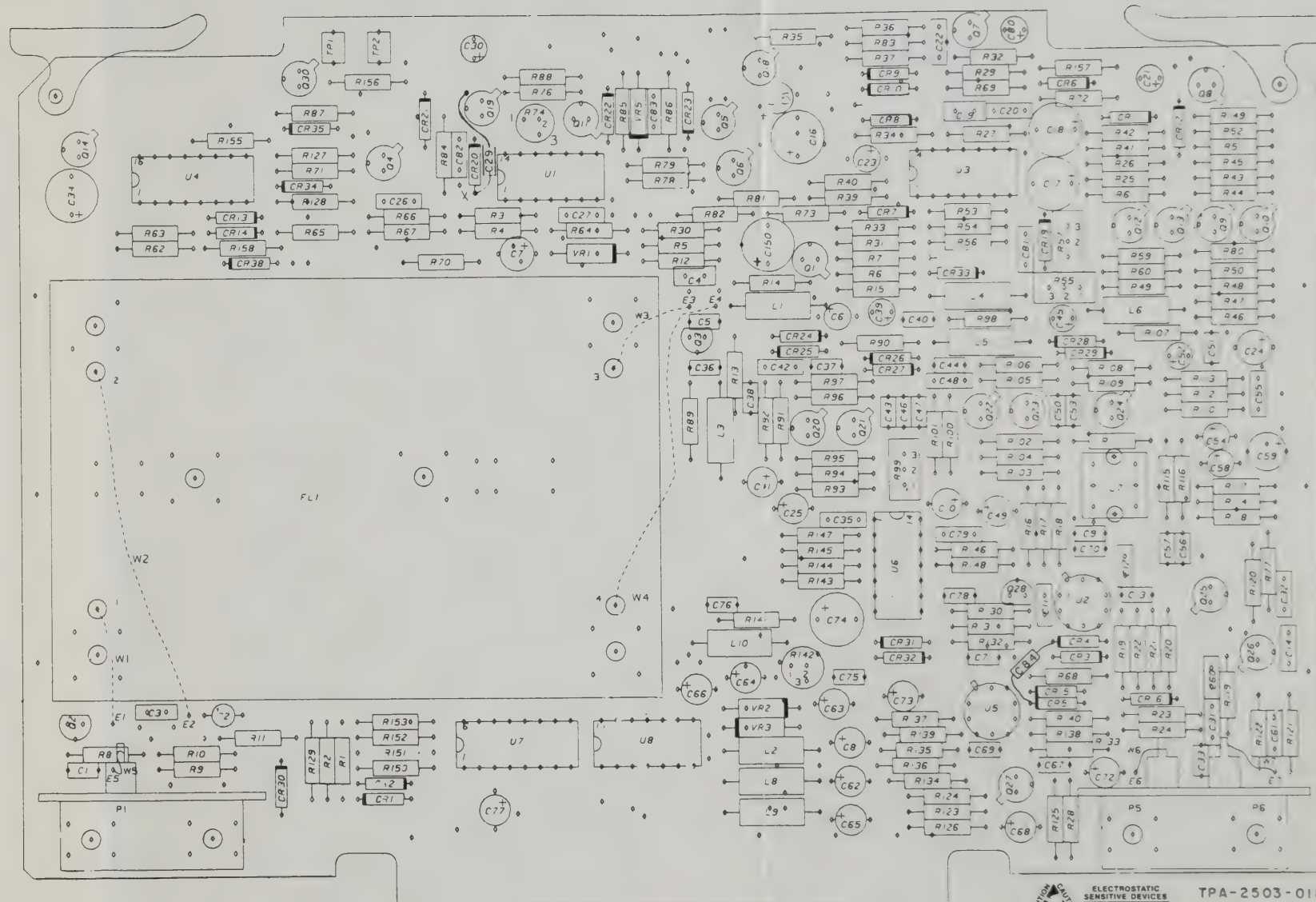
Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Channel B1/A2/B2 IF	638-6975-001	REV E
Channel B1/A2/B2 IF	638-6975-002	REV E
Channel B1/A2/B2 IF	638-6975-003	REV E
Channel B1/A2/B2 IF	638-6975-004	REV E
Channel B1/A2/B2 IF	638-6975-005	REV E
Channel B1/A2/B2 IF	638-6975-006	REV E



Channel B1/A2/B2 IF, Schematic Diagram
Figure 13 (Sheet 1 of 6)

TPA-2503-018



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PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	USABLE ON CODE	MFR CODE	MFR PART NUMBER	
	CHANNEL B1 IF (ESDS)	638-6975-001	A		1-000	81349	PCR07G104KS	
	CHANNEL A2 IF (ESDS)	638-6975-002	B		4-000	81349	RN550100CF	
	CHANNEL B2 IF (ESDS)	638-6975-003	C		5-560	81349	RN550150CF	
	CHANNEL B1 IF (ESDS)	638-6975-004	D		7-000	81349	RCR07G332KS	
	CHANNEL A2 IF (ESDS)	638-6975-005	E		9-000	81349	RCR07G334KS	
	CHANNEL B2 IF (ESDS)	638-6975-006	F		12-470	02111	64W203	
CR1-CR4	SEMICON DEVICE	353-3644-010		03508	16-000	81349	PCR07G821KS	
CR5,CR6	SEMICON DEVICE (ESDS)	353-3691-010		28480	12-460	02111	64W103	
CR7-CR14	SEMICON DEVICE	353-3644-010		03508	1			
CR15	SEMICON DEVICE (ESDS)	353-3691-010		28480	19-000	81349	PCR07G102KS	
CR16	SEMICON DEVICE	353-3691-010		03508	13-000	81349	RCR07G101KS	
CR17,	NOT USED	353-3644-010			13-000	81349	PCR07G472KS	
CR18					17-000	81349	RCR07G105KS	
CR19	SEMICON DEVICE (ESDS)	353-3691-010		28480	15-670	81349	RN550255CF	
CR20-	SEMICON DEVICE	353-3644-010		03508	15-000	81349	RCR07G103KS	
CR23					19-000	81349	RCR07G103KS	
CR24	SEMICON DEVICE (ESDS)	353-3691-010		28480	13-000	81349	RCR07G333KS	
CR25,	SEMICON DEVICE	922-6119-010		28480	15-000	81349	RCR07G221KS	
CR26					11-000	A,B,C	81349	RCR07G275JS
CR27	SEMICON DEVICE (ESDS)	353-3691-010		28480	11-000	81349	RCR07G104KS	
CR28	SEMICON DEVICE	922-6119-010		28480	10-000	81349	RCR07G475JS	
CR29	SEMICON DEVICE (ESDS)	353-3691-010		28480	13-000	81349	RCR07G224KS	
CR30-	SEMICON DEVICE	353-3644-010	A,D	03508	17-110	80294	3329HCT1-203	
CR32								
CR33-	SEMICON DEVICE	353-3644-010		03508	18-000	81349	RCR07G564KS	
CR35					11-000	81349	RCR07G222KS	
CR36,	NOT USED				10-000	81349	RCR07G184KS	
CR37					12-000	81349	RCR07G563KS	
CR38	SEMICON DEVICE	353-3644-010		03508	15-000	81349	RCR07G103KS	
C1	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	18-000	81349	RCR07G564KS	
C2	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	11-000	81349	RN550365CF	
C3	CAPACITOR,FXD MICA DIEL, 9PF, FORM 0.5PF, 300V	912-4141-530		72136	16-000	81349	RN550110CF	
C4	CAPACITOR,FXD MICA DIEL, 20PF, FORM 0.5PF, 100V	912-4141-150		93790	13-000	81349	RCR07G333KS	
					15-000	81349	RCR07G274JS	
C5	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	18-000	81349	RCR07G823KS	
C6	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	19-000	81349	RCR07G473KS	
C7,C8	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	11-000	81349	RCR07G222KS	
C9	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	15-580	81349	RN550165CF	
C10	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	17-000	81349	RCR07G154KS	
C11,C12	CAPACITOR,FXD MICA DIEL, 4PF, FORM 0.5PF, 300V	912-4141-080		93790	10-000	81349	RCR07G273KS	
C13	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	18-000	81349	RCR07G271KS	
C14	CAPACITOR,FXD CER DIEL, 4700PF, FORM10%, 100V	913-5019-160		81349	11-000	81349	RCR07G222KS	
C15	CAPACITOR,FXD TMTLM ELCTLT, 1.5UF, 20%, 25V	184-9102-210	D,E,F	56289	12-000	81349	RCR07G122KS	
C16	CAPACITOR,FXD TMTLM ELCTLT, 100UF, 20%, 10V	184-9102-100	A,B,C	56289	16-000	81349	RCR07G121KS	
C17,C18	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 25V	184-9102-250		56289	17-000	81349	RCR07G680KS	
C19	CAPACITOR,FXD MICA DIEL, 300PF, 5%, 50V	912-4141-480		93790	15-460	81349	RN5509311F	
C20	CAPACITOR,FXD CER DIEL, 2200PF, FORM10%, 100V	913-5019-120		81349	12-470	02111	64W203	
C21	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 15V	184-9102-140		56289	17-000	81349	RCR07G154KS	
C22	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	10-000	81349	RCR07G273KS	
C23	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	12-000	81349	RCR07G122KS	
C24	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	18-000	81349	RCR07G271KS	
C25	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	11-000	81349	RCR07G222KS	
C26,C27	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440	A,D	81349	16-000	81349	RCR07G121KS	
C28	NOT USED				17-000	81349	RCR07G680KS	
C29	CAPACITOR,FXD CER DIEL, 3300PF, FORM10%, 100V	913-5019-140		81349	10-000	81349	RN550133CF	
C30	CAPACITOR,FXD TMTLM ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	13-000	81349	RCR07G333KS	
C31	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	10-000	81349	RCR07G184KS	
C32	CAPACITOR,FXD CER DIEL, 4700PF, FORM10%, 100V	913-5019-160		81349	19-000	81349	RCR07G102KS	
C33	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200	A,B,C	81349	12-000	81349	RCR07G822KS	
C34	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 25V	184-9102-250		56289	13-000	81349	RCR07G101KS	
C35	CAPACITOR,FXD CER DIEL, 0.033UF, FORM10%, 100V	913-5019-330	A,D	81349	16-000	81349	RCR07G821KS	
C36	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	19-000	81349	RCR07G102KS	
C37	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	12-000	81349	RCR07G563KS	
C38	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	10-000	81349	RCR07G273KS	
C39	CAPACITOR,FXD CER DIEL, 0.47UF, FORM10%, 50V	913-5019-520		81349	14-000	81349	RCR07G391KS	
C40	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	10-000	81349	RCR07G560KS	
C41	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	17-000	81349	RCR07G332KS	
C42	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	10-000	81349	RCR07G560KS	
C43	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	19-000	81349	RCR07G220KS	
C44	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	12-000	81349	RCR07G361JS	
C45	CAPACITOR,FXD CER DIEL, 0.47UF, FORM10%, 50V	913-5019-520		81349	16-000	81349	RCR07G562KS	
C46,C47	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	1			
C48	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	19-000	81349	RCR07G102KS	
C49	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	16-000	81349	RCR07G821KS	
C50	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	17-000	81349	RCR07G105KS	
C51	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	11-000	A,D	81349	RCR07G104KS
C52	CAPACITOR,FXD CER DIEL, 0.39UF, FORM10%, 50V	913-5019-510		81349	15-000	A,D	81349	RCR07G103KS
C53	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	18-000	81349	RCR07G564KS	
C54	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	19-000	81349	RCR07G102KS	
C55	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	1			
C56	CAPACITOR,FXD CER DIEL, 2200PF, FORM10%, 100V	913-5019-120		81349	13-000	81349	RCR07G101KS	
C57	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	15-000	81349	RCR07G103KS	
C58	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289				
C59	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	19-000	81349	RCR07G102KS	
C60	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-280		93790	19-000	81349	RCR07G682KS	
C61	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	1			
C62-C66	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	19-000	81349	RCR07G102KS	
C67	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	17-000	81349	RCR07G332KS	
C68	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	19-000	81349	RCR07G102KS	
C69,C70	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	17-080	80294	3329HCT1-202	
C71	CAPACITOR,FXD CER DIEL, 150PF, 10%, 200V	913-4008-000		81349	13-000	A,D	81349	RCR07G472KS

matic Diagram

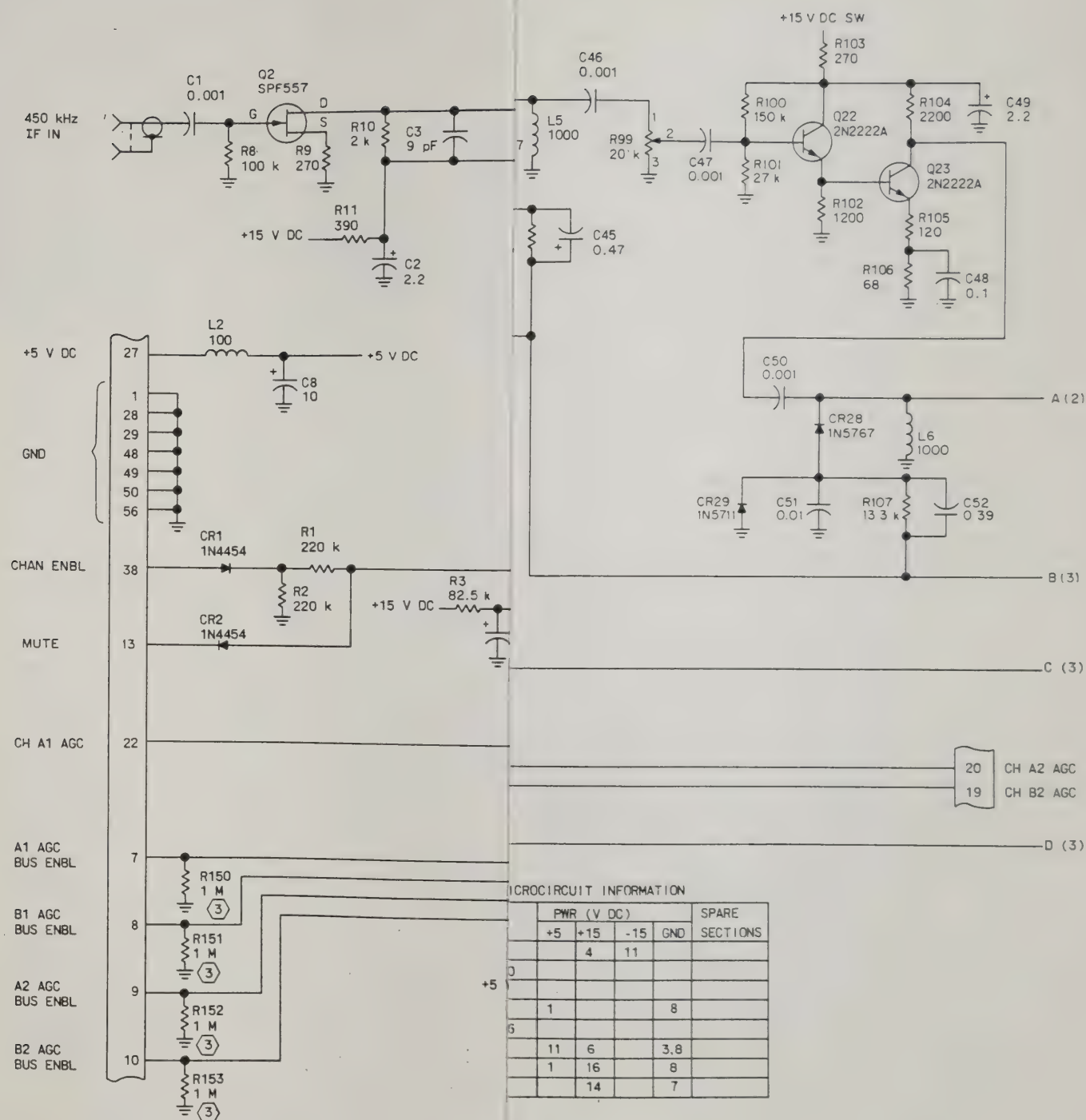
(2)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	CHANNEL B1 IF (ESDS)	638-6975-001	A		
	CHANNEL A2 IF (ESDS)	638-6975-002	B		
	CHANNEL B2 IF (ESDS)	638-6975-003	C		
	CHANNEL B1 IF (ESDS)	638-6975-004	D		
	CHANNEL A2 IF (ESDS)	638-6975-005	E		
	CHANNEL B2 IF (ESDS)	638-6975-006	F		
CR1-CR4	SEMICONV DEVICE	353-3644-010		03508	IN4454GE
CR5,CR6	SEMICONV DEVICE (ESDS)	353-3691-010		28480	IN5711
CR7-CR14	SEMICONV DEVICE	353-3644-010		03508	IN4454GE
CR15	SEMICONV DEVICE (ESDS)	353-3691-010		28480	IN5711
CR16	SEMICONV DEVICE	353-3644-010		03508	IN4454GE
CR17,	NOT USED				
CR18					
CR19	SEMICONV DEVICE (ESDS)	353-3691-010		28480	IN5711
CR20-	SEMICONV DEVICE	353-3644-010		03508	IN4454GE
CR23					
CR24	SEMICONV DEVICE (ESDS)	353-3691-010		28480	IN5711
CR25,	SEMICONV DEVICE	922-6119-010		28480	IN5767
CR26					
CR27	SEMICONV DEVICE (ESDS)	353-3691-010		28480	IN5711
CR28	SEMICONV DEVICE	922-6119-010		28480	IN5767
CR29	SEMICONV DEVICE (ESDS)	353-3691-010		28480	IN5711
CR30-	SEMICONV DEVICE	353-3644-010	A,D	03508	IN4454GE
CR32					
CR33-	SEMICONV DEVICE	353-3644-010		03508	IN4454GE
CR35,					
CR36,	NOT USED				
CR37					
CR38	SEMICONV DEVICE	353-3644-010		03508	IN4454GE
C1	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C2	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C3	CAPACITOR,FXD MICA DIEL, 9PF, FORM 0.5PF, 300V	912-4141-530		72136	DHSC0900300WV
C4	CAPACITOR,FXD MICA DIEL, 20PF, FORM 0.5PF, 100V	912-4141-150		93790	CD5EA20000
C5	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C6	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C7,C8	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199D106X0020CE3
C9	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	CK05BX103K
C10	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199D106X0020CE3
C11,C12	CAPACITOR,FXD MICA DIEL, 4PF, FORM 0.5PF, 300V	912-4141-080		93790	CD5CC04000
C13	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	CK05BX103K
C14	CAPACITOR,FXD CER DIEL, 4700PF, FORM10%, 100V	913-5019-160		81349	CK05BX472K
C15	CAPACITOR,FXD THTLM ELCTLT, 1.5UF, 20%, 25V	184-9102-210	D,E,F	56289	199D155X0025AB1
C16	CAPACITOR,FXD THTLM ELCTLT, 100UF, 20%, 10V	184-9102-100	A,B,C	56289	196D235
C17,C18	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-250		56289	199D226X0025PE4
C19	CAPACITOR,FXD MICA DIEL, 300PF, 5%, 50V	912-4141-490		93790	CD5FY301J0
C20	CAPACITOR,FXD CER DIEL, 2200PF, FORM10%, 100V	913-5019-120		81349	CK05BX222K
C21	CAPACITOR,FXD THTLM ELCTLT, 22UF, 20%, 15V	184-9102-140		56289	199D226X00150B1
C22	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	CK06BX104K
C23	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C24	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199D106X0020CE3
C25	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C26,C27	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440	A,D	81349	CK06BX104K
C28	NOT USED				
C29	CAPACITOR,FXD CER DIEL, 3300PF, FORM10%, 100V	913-5019-140		81349	CK05BX332K
C30	CAPACITOR,FXD THTLM ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	199D68X00060B1
C31	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	CK06BX104K
C32	CAPACITOR,FXD CER DIEL, 4700PF, FORM10%, 100V	913-5019-160		81349	CK05BX472K
C33	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200	A,B,C	81349	CK05BX103K
C34	CAPACITOR,FXD THTLM ELCTLT, 22UF, 20%, 25V	184-9102-250		56289	199D226X0025PE4
C35	CAPACITOR,FXD CER DIEL, 0.033UF, FORM10%, 100V	913-5019-330	A,D	81349	CK06BX333K
C36	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C37	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	CK05BX103K
C38	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C39	CAPACITOR,FXD CER DIEL, 0.47UF, FORM10%, 50V	913-5019-520		81349	CK06BX474K
C40	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	CK05BX103K
C41	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C42	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	CK06BX104K
C43	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C44	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	CK05BX103K
C45	CAPACITOR,FXD CER DIEL, 0.47UF, FORM10%, 50V	913-5019-520		81349	CK06BX474K
C46,C47	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C48	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	CK06BX104K
C49	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C50	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C51	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		81349	CK05BX103K
C52	CAPACITOR,FXD CER DIEL, 0.39UF, FORM10%, 50V	913-5019-510		81349	CK06BX394K
C53	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C54	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C55	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	CK06BX104K
C56	CAPACITOR,FXD CER DIEL, 2200PF, FORM10%, 100V	913-5019-120		81349	CK05BX222K
C57	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C58	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C59	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199D106X0020CE3
C60	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-280		93790	CD5EY470J0
C61	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	CK06BX104K
C62-C66	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199D106X0020CE3
C67	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C68	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199D106X0020CE3
C69,C70	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C71	CAPACITOR,FXD CER DIEL, 150PF, 10%, 200V	913-4008-000		81349	CK05BX151K

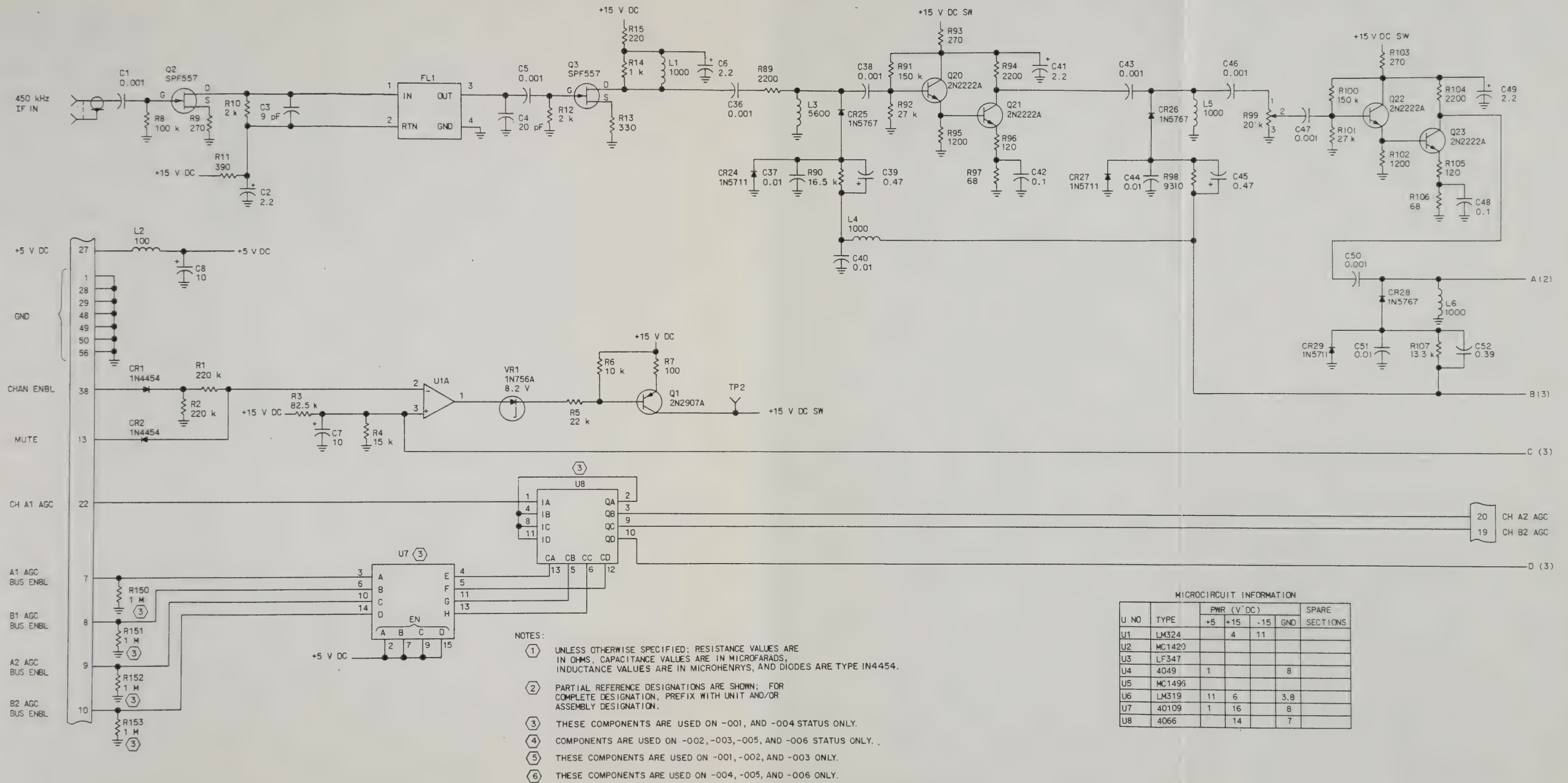
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
C72,C73	CAPACITOR,FXD THTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199D225X0025BE3
C74	CAPACITOR,FXD THTLM ELCTLT, 47UF, 20%, 20V	184-9102-630		56289	199D1022
C75,C76	CAPACITOR,FXD CER DIEL, 4700PF, FORM10%, 100V	913-5019-160		81349	CK05BX472K
C77	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199D106X0020CE3
C78	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000	A,D	81349	CK05BX102K
C79	CAPACITOR,FXD CER DIEL, 0.22UF, FORM10%, 50V	913-5019-480	A,D	81349	CK06BX224K
C80	CAPACITOR,FXD THTLM ELCTLT, 22UF, 20%, 15V	184-9102-140		56289	199D226X00150B1
C81	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 100V	913-5019-440		81349	CK06BX104K
C82	CAPACITOR,FXD CER DIEL, 0.47UF, FORM10%, 50V	913-5019-520		81349	CK06BX474K
C83	CAPACITOR,FXD CER DIEL, 0.33UF, FORM10%, 50V	913-5019-500		81349	CK06BX334K
C84	CAPACITOR,FXD MICA DIEL, 10PF, FORM 0.5PF, 300V	912-4141-020		93790	CD5CC10000
C85-C149	NOT USED				
C150	CAPACITOR,FXD THTLM ELCTLT, 47UF, 20%, 20V	184-9102-630		56289	199D1022
FL1	FILTER,BP	293-1331-020	A,D	00136	293-1331-020
FL1	FILTER,BP	293-1331-030	B,E	00136	293-1331-030
FL1	FILTER,BP	293-1331-040	C,F	00136	293-1331-040
L1	COIL,RF 1000UH	240-2715-490		96906	MS75089-23
L2	COIL,RF 100UH	240-2715-370		96906	MS75089-11
L3	COIL, SHIELDED 5600UH	637-3767-001		637-3767-001	
L4-L6	COIL,RF 1000UH	240-2715-490		96906	MS75089-23
L7	INDUCTOR,RF	242-0441-010		02113	242-0441-010
L8,L9	COIL,RF 100UH	240-2715-370		96906	MS75089-11
L10	COIL,RF 1000UH	240-2715-490		96906	MS75089-23
P1	CONNECTOR,RCPT ELEC	357-7207-100		98291	52-046-0000
P2-P4	NOT USED				
P5,P6	CONNECTOR,RCPT ELEC	357-7207-100		98291	52-046-0000
Q1	TRANSISTOR	352-0551-010		15818	2N2907A
Q2,Q3	TRANSISTOR (ESDS)	352-1068-010		04713	SPF557
Q4	TRANSISTOR (ESDS)	352-0605-010	A,B,C	04713	2N2608
Q5	TRANSISTOR	352-0605-010		04713	2N2608
Q6	TRANSISTOR (ESDS)	352-0759-010		00872	2N4091
Q7	TRANSISTOR (ESDS)	352-1069-010		17856	2N5432
Q8	TRANSISTOR	352-0661-020		07263	2N2222A
Q9,Q10	TRANSISTOR	352-0551-010		15818	2N2907A
Q11	TRANSISTOR (ESDS)	352-0605-010	A,B,C	04713	2N2608
Q12,Q13	TRANSISTOR	352-0661-020		07263	2N2222A
Q14	TRANSISTOR (ESDS)	352-0605-010		04713	2N2608
Q15-Q17	NOT USED				
Q18	TRANSISTOR	352-0605-010		04713	2N2608
Q19-Q27	TRANSISTOR	352-0661-020		07263	2N2222A
Q28	TRANSISTOR (ESDS)	352-1068-010		04713	SPF557
Q29	NOT USED				
Q30	TRANSISTOR (ESDS)	352-0759-010	A,D	00872	2N4091
R1,R2	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R3	RESISTOR,FXD FILM, 82.5K, 1%, 1/8W	705-1088-000		81349	RN55D8252F
R4	RESISTOR,FXD FILM, 15K, 1%, 1/8W	705-3605-560		81349	RN55D1502F
R5	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R6	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R7	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R8	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R9	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R10	RESISTOR,FXD FILM, 2K, 1%, 1/8W	705-3605-140		81349	RN55D2001F
R11	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR07G391KS
R12	RESISTOR,FXD FILM, 2K, 1%, 1/8W	705-3605-140		81349	RN55D2001F
R13	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R14	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R15	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R16	RESISTOR,FXD FILM, 100K, 1%, 1/8W	705-1092-000		81349	RN55D1003F
R17	RESISTOR,FXD FILM, 121K, 1%, 1/8W	705-1096-000		81349	RN55D1213F
R18	RESISTOR,FXD FILM, 22.1K, 1%, 1/8W	705-3605-640		81349	RN55D02212F
R19	RESISTOR,FXD FILM, 12K, 10%, 1/4W	745-0788-000		81349	RCR07G123KS
R20	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G332KS
R21	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0824-000		81349	RCR07G124KS
R22	RESISTOR,FXD CHPSN, 12K, 10%, 1/4W	745-0788-000		81349	RCR07G123KS
R23	RESISTOR,FXD CHPSN, 0.56MEGO, 5%, 1/4W	745-0847-000		81349	RCR07G564JS
R24	RESISTOR,FXD CHPSN, 56K, 10%, 1/4W	745-0812-000		81349	RCR07G563KS
R25	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R26	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R27	RESISTOR,FXD CHPSN, 10MEGO, 10%, 1/4W	745-0893-000		81349	RCR07G106KS
R28	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0704-000	B,C,E,F	81349	RCR07G560



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Channel B1/A2/B2 IF, Schematic Diagram
Figure 13 (Sheet 3)



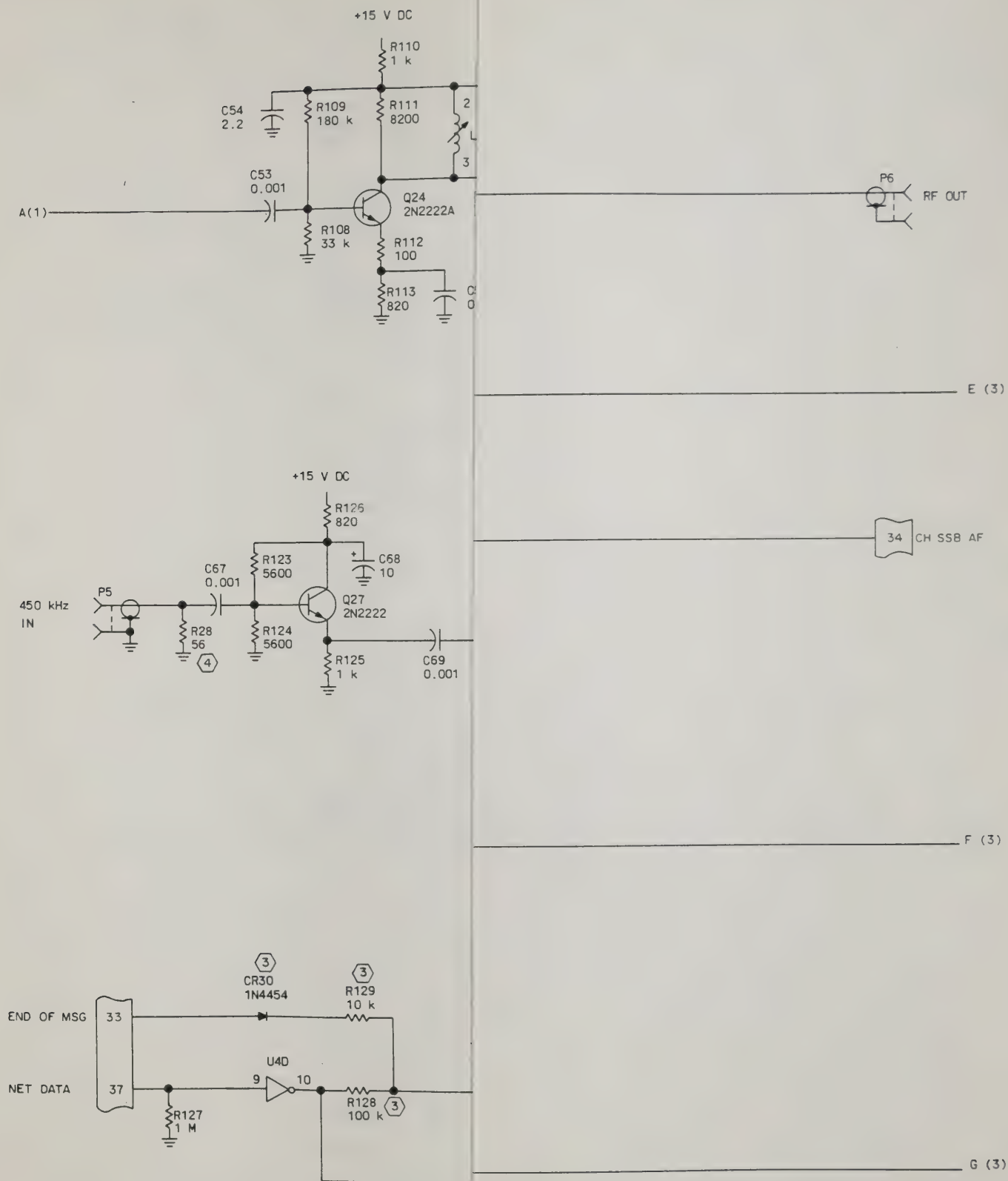
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
R144	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000	A,D	81349
R145	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000	A,D	81349
R146	RESISTOR,FXD FILM, 121K, 1%, 1/8W	705-1096-000	A,D	81349
R147,	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000	A,D	81349
R148				
R149	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349
R150-	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000	A,D	81349
R153				
R154	NOT USED			
R155	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R156	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R157	RESISTOR,FXD FILM, 8.2 OHMS, 5%, 1/4W	745-0910-150		09021
R158	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
TP1	JACK,TIP BRN	360-0484-070		74970
TP2	JACK,TIP RED	360-0484-020		74970
U1	AMPLIFIER,QUAD	351-1141-030		12040
U2	INTEGRATED CIRCUIT	351-1050-030		04713
U3	INTEGRATED CIRCUIT OPRTNL AMPLIFIER,QUAD	351-1370-020		27014
U4	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263
U5	INTEGRATED CIRCUIT	351-0043-020		04713
U6	INTEGRATED CIRCUIT	351-1166-010	A,D	27014
U7	INTEGRATED CIRCUIT (ESDS)	351-8458-010	A,D	02735
U8	INTEGRATED CIRCUIT (ESDS)	351-8252-010	A,D	02735
VR1-VR3	SEMICOND DEVICE	353-2720-000		81483
VR4	NOT USED			
VR5	SEMICOND DEVICE	353-3591-440		04713

PARTS LIST (Cont)

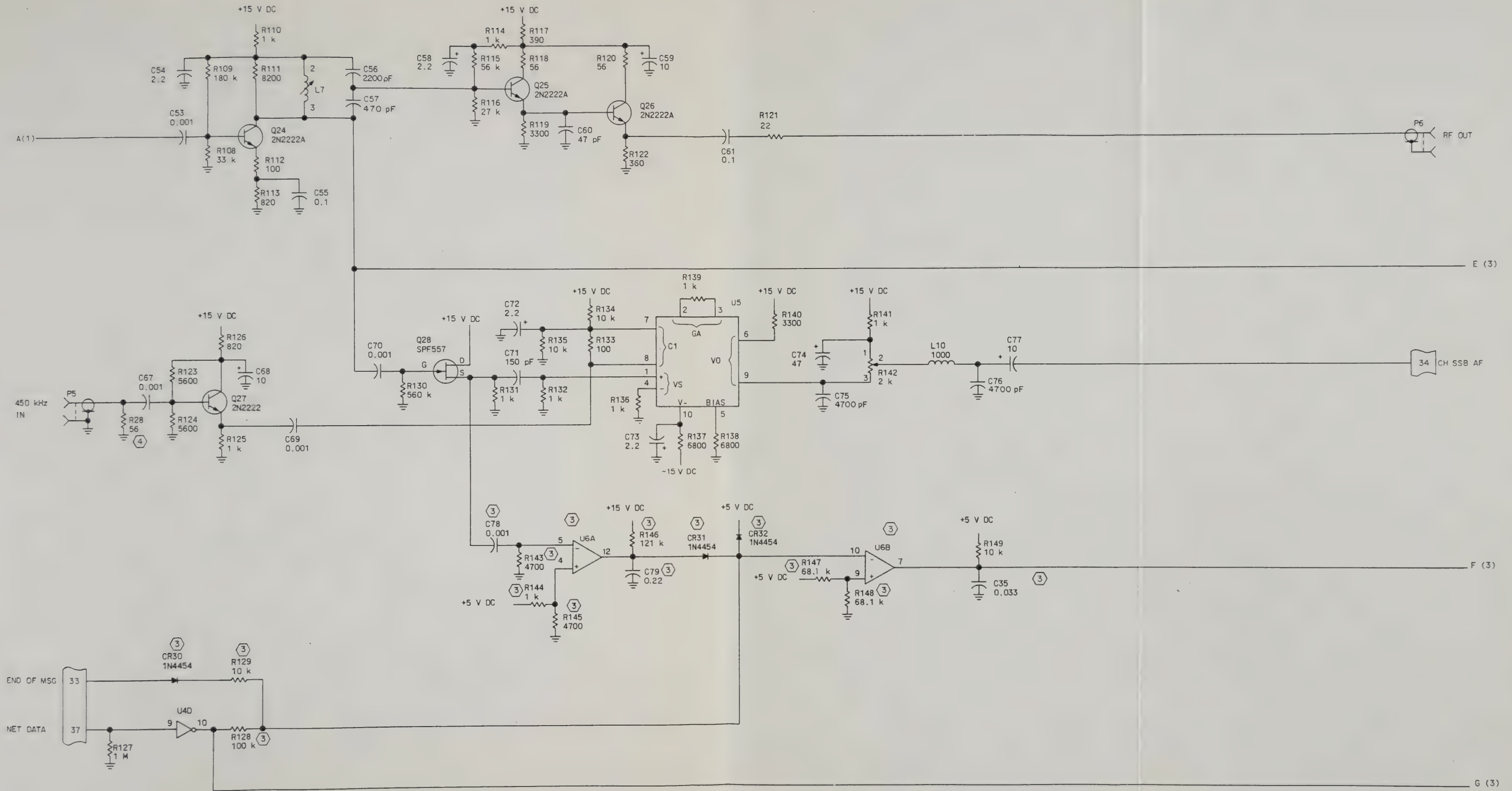
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R144	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000	A,D	81349	RCR07G105KS
R145	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000	A,D	81349	RCR07G472KS
R146	RESISTOR,FXD FILM, 121K, 1%, 1/8W	705-1096-000	A,D	81349	RN55D1213F
R147	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000	A,D	81349	RN55D6812F
R148					
R149	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R150	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000	A,D	81349	RCR07G105KS
R153					
R154	NOT USED				
R155	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R156	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R157	RESISTOR,FXD FILM, 8.2 OHMS, 5%, 1/4W	745-0910-150		09021	CF1-4-8R20J
R158	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
U1	AMPLIFIER,QUAD	351-1141-030		12040	LM324N
U2	INTEGRATED CIRCUIT	351-1050-030		04713	MC1420G
U3	INTEGRATED CIRCUIT OPRNL AMPLIFIER,QUAD	351-1370-020		27014	LF347N
U4	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049BPC
U5	INTEGRATED CIRCUIT	351-0043-020		04713	MC1496G
U6	INTEGRATED CIRCUIT	351-1166-010	A,D	27014	LM319N
U7	INTEGRATED CIRCUIT (ESDS)	351-8458-010	A,D	02735	CD40109BE
U8	INTEGRATED CIRCUIT (ESDS)	351-8252-010	A,D	02735	CD4066BE
VR1-VR3	SEMICONO DEVICE	353-2720-000		81483	1N756A
VR4	NOT USED				
VR5	SEMICONO DEVICE	353-3591-440		04713	1N4620

Channel B1/A2/B2 IF, Schematic Diagram
Figure 13 (Sheet 4)



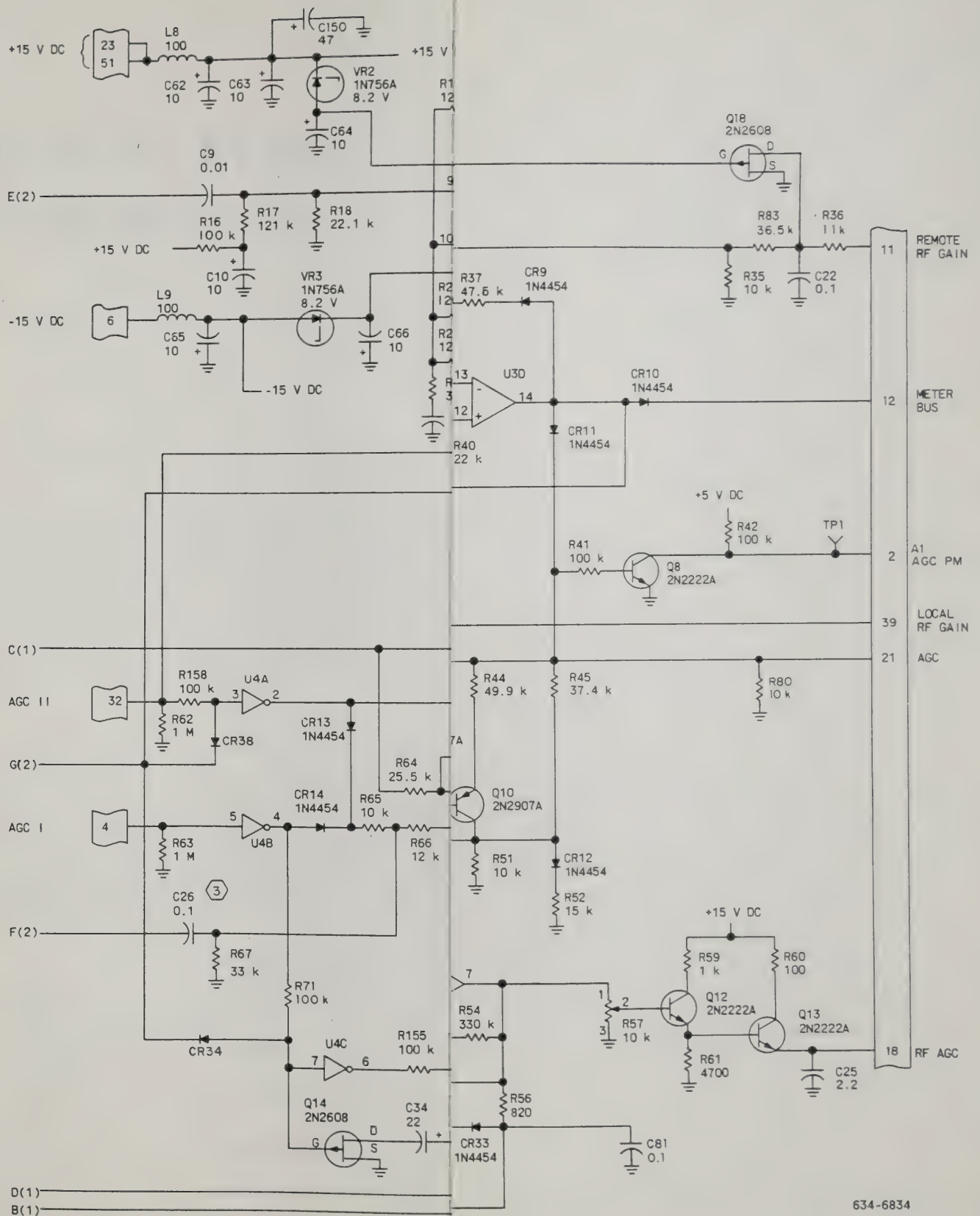
634-6834

Channel B1/A2/B2 IF, Schematic Diagram
Figure 13 (Sheet 5)



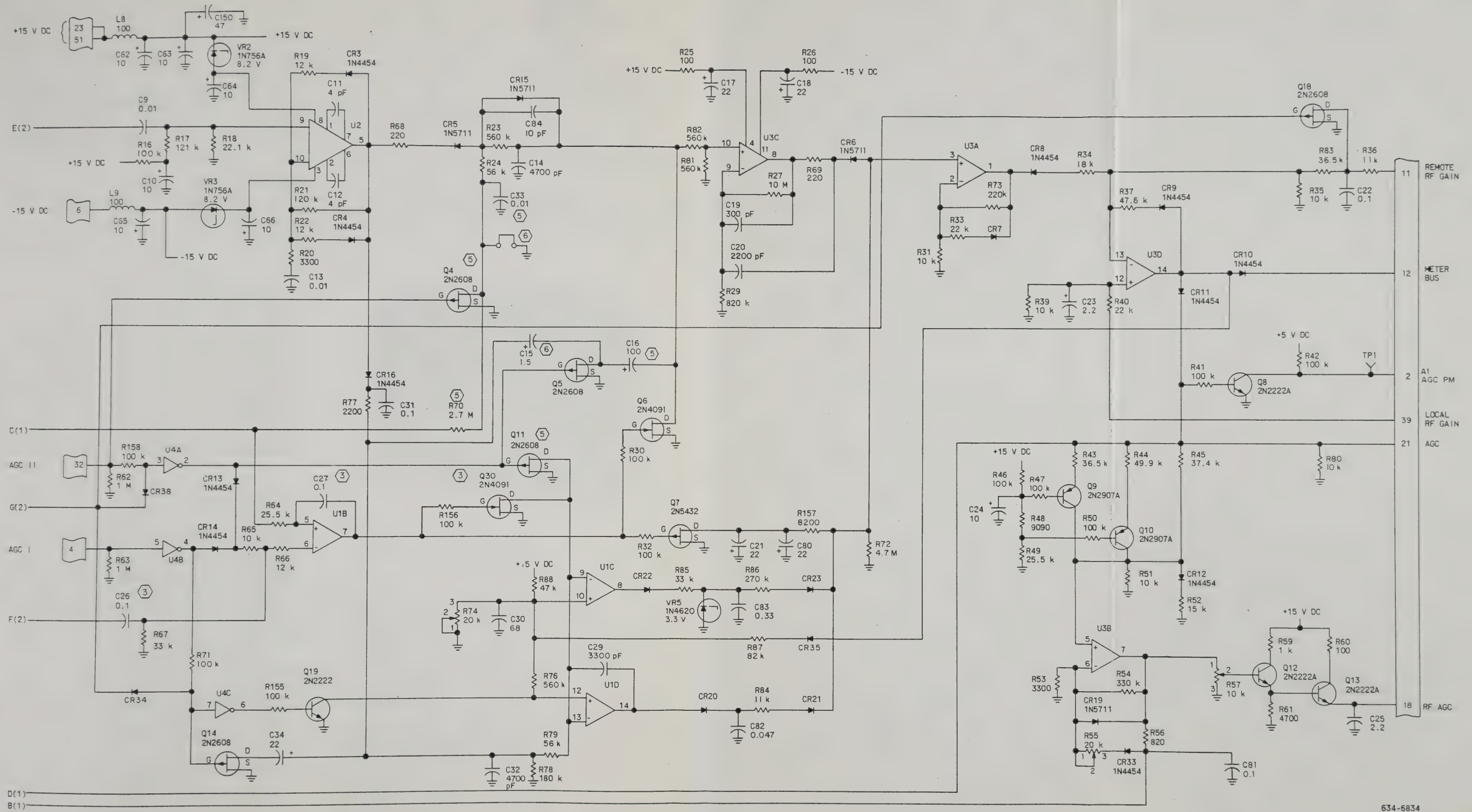
634-6834

Channel B1/A2/B2 IF, Schematic Diagram
Figure 18 (Sheet 5)



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Channel B1/A2/B2 IF, Schematic Diagram
Figure 13 (Sheet 6)



634-6834

Channel B1/A2/B2 IF, Schematic Diagram
Figure 13 (Sheet 6)



**Rockwell
International**

instructions

Channel A1 IF (638-6871-())

Collins Telecommunications Products Division

523-0770709-001211

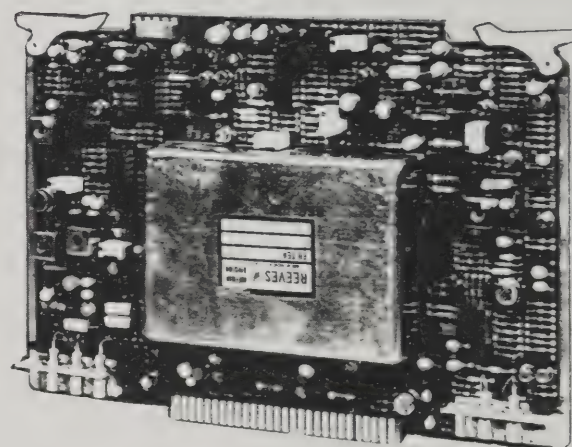
1 January 1981

Printed in USA

Channel A1 IF
(638-6871-())

1. DESCRIPTION

Channel A1 IF, 638-6871-(), shown in figure 1, is a 3-layer planar card with a 56-pin, edge-on connector (2 layers, 28 pins each), three on-card connectors and five subminiature rf connectors. The 56-pin connector (P4) is for all signals to or from the card except bandwidth filter (J8, J9, J10), i.f. input (P1), i.f. outputs (P3 and P6), 9.0-MHz injection (P2, for the mixer), and 450-kHz injection (P5, for the SSB product detector).



TPA-3076-017

Channel A1 IF
Figure 1

The channel A1 i.f. card consists of mixer, i.f. amplifier, product detector, and AGC circuits. Difference between the circuit cards is in the AGC time constants. The filter passband is 2.85 kHz at the 1-dB points with center frequency i.f. 451.675 kHz for USB operation. (The LSB, LLSB, and UUSB filters are on circuit cards 638-6975-001 through -006.) AGC time constants for the applicable AGC switch position are:

FAST	20 ms attack, 15 - 30 ms decay
MED	20 ms attack, 70 - 150 ms decay
SLOW	20 ms attack, 1 - 2 s decay
VOICE	20 ms attack, 1 - 2 s decay
DATA	20 ms attack, 15 - 30 ms decay
FAX	1.5 $\pm$ 0.5s attack, 3-6s decay

The card configuration differences are as follows:

- 638-6871-001 — VOICE-DATA-FAX time constants.

- 638-6871-002 — FAST-MED-SLOW time constants.

2. PRINCIPLES OF OPERATION

2.1 General

The channel A1 i.f. card receives the 9.45-MHz i.f., 9-MHz and 450-kHz injections, and control signals. The card develops the following outputs:

- 450-kHz receive i.f.
- AM and SSB audio
- AGC signals
- Performance monitor signals
- Front panel meter AGC and receive-signal-strength signals

523-0770709-001211

2.2 IF and AF Signals (Refer to figure 2.)

The 9.45-MHz i.f. signal and 9.0-MHz injection are applied to mixer U1 to develop a 450-kHz i.f. signal. The 450-kHz i.f. is applied to gain-controlled amplifier stages through filter FL1 and is output to the channel B1/A2/B2 i.f. cards. The amplifier stages have switched collector voltages. Voltage presence is inhibited by the MUTE or enabled by the CHAN A1, AM, or CW ENABLE inputs.

The amplified i.f. signal is applied to a product detector, AM detector, AGC detector, and additional amplifiers. A 450-kHz injection signal is applied to the product detector for detecting the audio in the i.f. signal. The AM detector detects the AM audio in the i.f. These audio signals and the amplified 450-kHz i.f. signal are applied to other circuit cards.

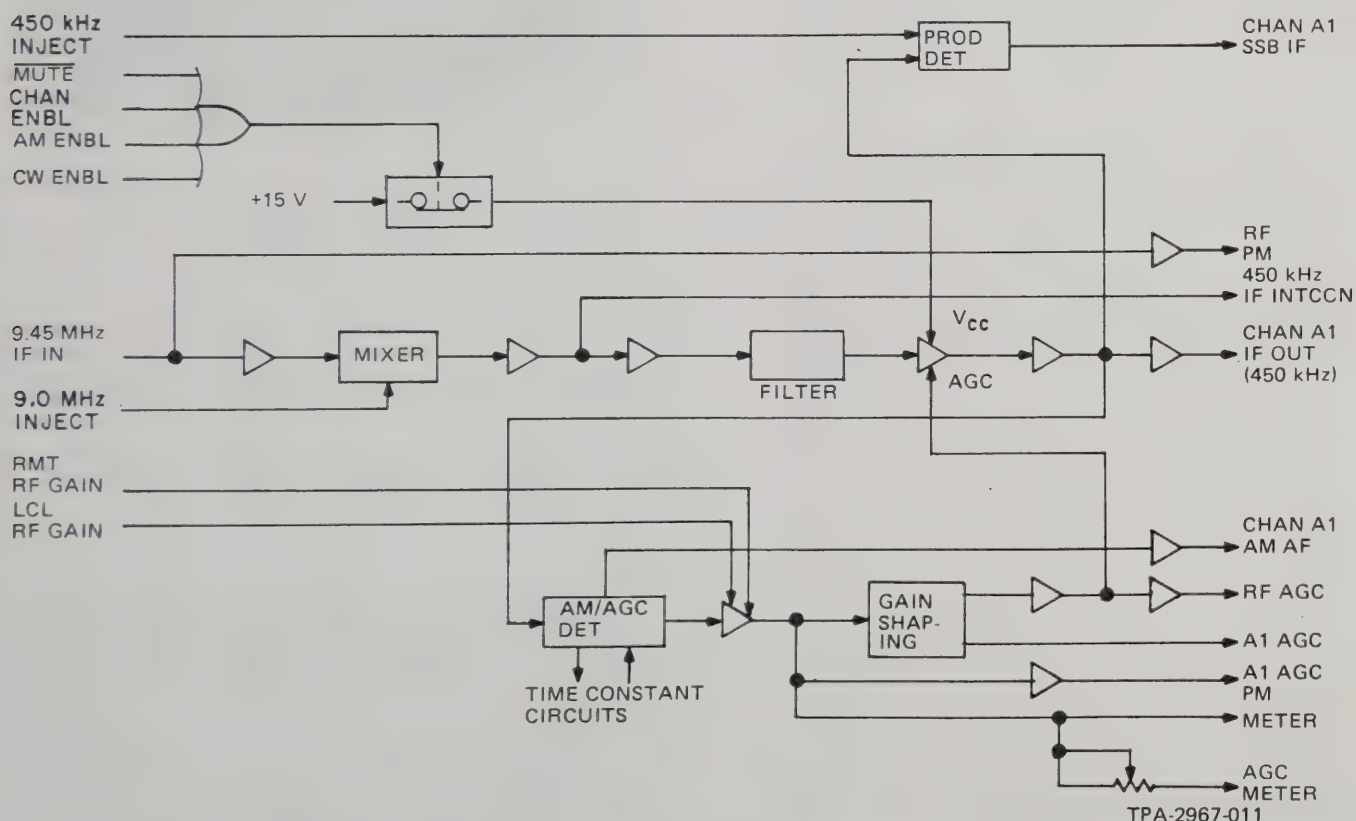
2.3 AGC Signals (Refer to figures 3 and 4.)

The 450-kHz i.f. signal is applied to an AM detector. The AM detector output is applied to an AGC detector and to the AGC circuits. AGC signals are developed

through rc time constants selected by the receiver AGC switch. The AGC I and AGC II inputs to the AGC circuits control the time constant selection. Table 1 lists the logic levels associated with the receiver AGC switch positions.

The AGC I signal controls the slow or voice time constant. The AGC II signal controls the fast or data and medium or fax time constants. For the 638-6871-001 circuit card, the AGC II signal grounds capacitors in the AGC detector circuit and grounds the AM detector output applied to the AGC comparator circuits. For the 638-6871-002 circuit card, the AGC II signal grounds a capacitor in the AGC detector output. This enables the medium or fax time constant capacitor in the AGC hang circuit. The AGC I signal selects the appropriate AGC comparator and the slow or voice time constant capacitor in both circuit card configurations. (The differences are illustrated in figures 3 and 4.)

The selected (enabled) AGC comparator inputs are the AM detector output, modified by the selected hang time constant capacitor, and the AGC output



IF and AGC Signal Paths
Figure 2

Table 1. AGC I and AGC II Logic Levels.

AGC		SWITCH POSITION	
I	II		
1	1	OFF	OFF
0	0	FAST	DATA
0	1	MED	FAX
1	0	SLOW	VOICE

from U6D. The comparator output, an AGC analog voltage, is applied through buffer amplifier U6C to amplifier U6D. This amplifier is gain-controlled by the local or remote rf gain signal. The amplifier output is used as an AGC performance monitor and AGC and received-signal-strength signal for the front panel meter. The output is also applied to a gain shaping circuit. The gain shaping amplifier keeps the AGC signal linear with respect to the received-signal

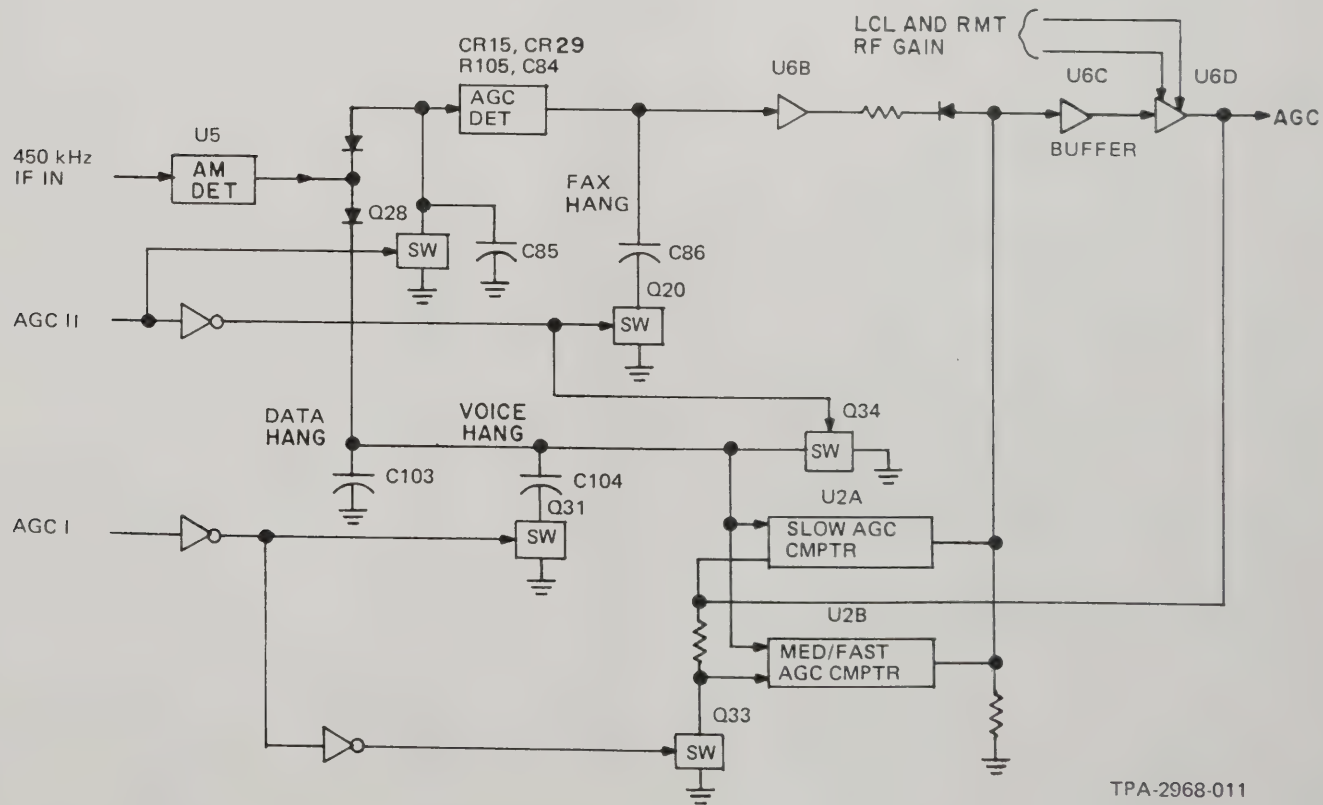
strength. Output from this amplifier is fed back as the i.f. amplifier AGC, and output as the A1 AGC signal to other circuit cards.

2.4 AGC Crowbar (Refer to figures 5 and 11.)

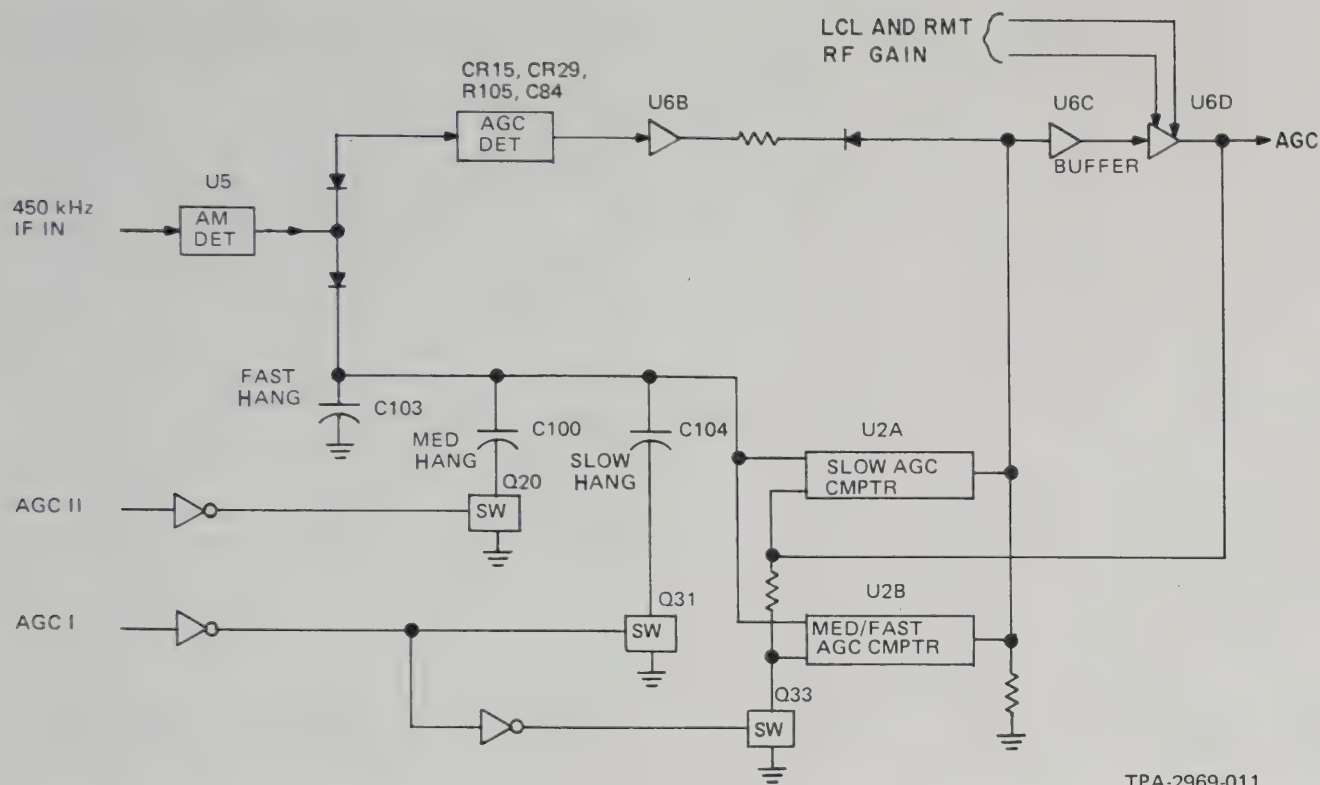
The AGC crowbar circuits discharge the AGC capacitors when the i.f. signal level drops below about three volts or when the END OF MSG signal (in NET DATA mode) is applied. This permits the i.f. amplifier to operate at maximum gain for weak receive signals.

When the i.f. signal drops below the reference voltage level at U2D, the comparator output goes positive to gate on Q30 to discharge AGC capacitors C91 and C118, Q29 to ground the AGC preamplifier input, and Q32 to ground inputs to the AGC comparators. This causes the AGC signal to go to zero, allowing maximum i.f. amplifier gain.

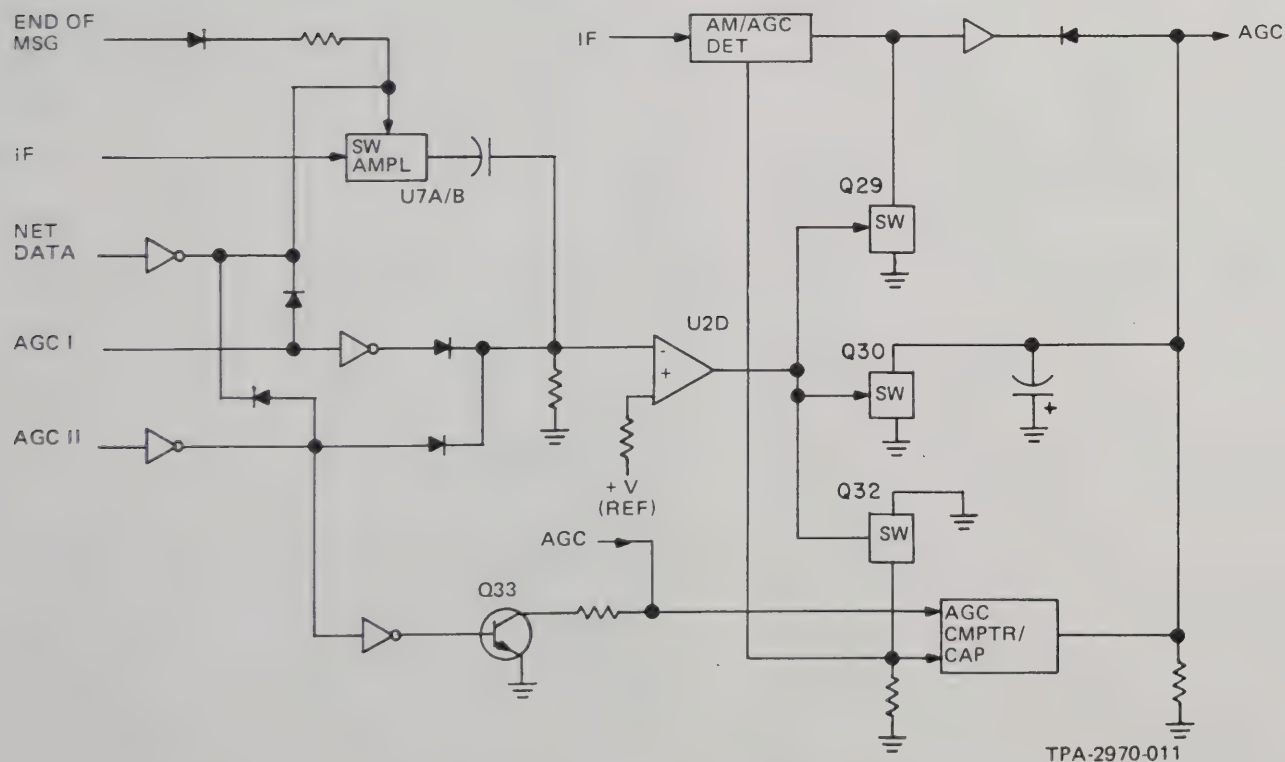
When the receiver is in the NET DATA mode, a logic 0 is applied to the junction of CR36, CR37, and the inverting input of U7B. (Refer to the schematic



AGC Time Constant Circuit for 638-6871-011
Figure 3



AGC Time Constant Circuit for 638-6871-002
Figure 4.



AGC Crowbar Circuit
Figure 5

diagram, figure 11.) The momentary END OF MSG pulse places a logic 1 at this junction. The resulting logic 0 output pulse is applied to AGC crowbar comparator U2D, inverting input. The positive output pulse from U2D momentarily gates on Q30, Q29, and Q32 to cause the AGC time constant capacitors to discharge. This permits the next net data message to be applied at full i.f. amplifier gain.

2.5 Differential Output Operational Amplifier 351-1050-030 (Refer to figure 6.)

The 351-1050-030 is a wide-band general-purpose operational amplifier which features both differential inputs and outputs. Open loop gain is adjustable with external feedback components.

2.6 Quad Operational Amplifier 351-1141-030 (Refer to figure 7.)

The 351-1141-030 consists of four independent, high-gain internally frequency-compensated operational amplifiers that are designed to operate from a single

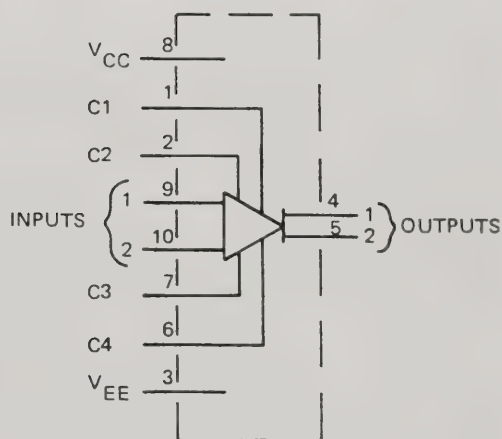
power supply over a wide range of voltages. Common applications include transducer amplifiers, dc gain blocks, and all conventional operational amplifier circuits.

2.7 Quad Operational Amplifier 351-1370-020 (Refer to figure 8.)

The 351-1370-020 consists of four independent, high-speed operational amplifiers with internally-adjusted input offset voltage. The amplifiers have low noise and offset voltage drift. Common applications include high-speed integrators, sample-and-hold circuits, and d/a converters.

2.8 Balanced Modulator-Demodulator 351-0043-020 (Refer to figure 9.)

The 351-0043-020 is designed for use where the output voltage is a product of an input voltage (signal) and a switching function carrier. Typical applications include suppressed carrier and amplitude modulation, synchronous detection, FM detection, phase detection, and chopper applications.



CHARACTERISTICS

SUPPLY VOLTAGE: V_{CC} +8 V DC MAX.,
 V_{EE} -8 V DC MAX.

INPUT DIFF VOLTAGE: ± 8 V DC MAX.

INPUT COMMON MODE VOLTAGE:
 ± 3.0 V PEAK

INPUT RESISTANCE: 2.0 M OHM TYPICAL

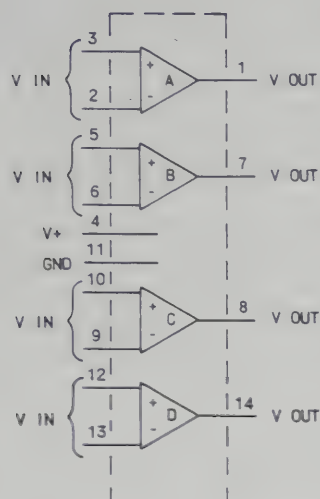
OUTPUT RESISTANCE: 50 OHM TYPICAL

OPEN LOOP GAIN: SINGLE ENDED—
750 V/V MIN, 1500 V/V TYPICAL;
DIFFERENTIAL — 1500 V/V MIN.,
3000 V/V TYPICAL

BANDWIDTH: OPEN LOOP—2.0 MHz TYPICAL;
CLOSED LOOP —10.0 MHz TYPICAL

TP5-2282-011

Differential Output Operational Amplifier 351-1050-030
Figure 6



CHARACTERISTICS

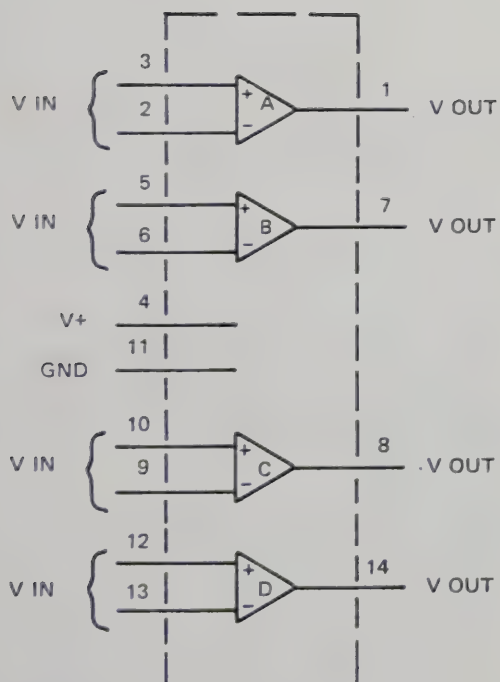
SUPPLY VOLTAGE (V+): 32 V DC MAX
 INPUT DIFF VOLTAGE: 32 V DC MAX
 INPUT COMMON MODE VOLTAGE: V+ (-1.5 V DC)
 OUTPUT SHORT CIRCUIT DURATION:
 CONTINUOUS (1)
 VOLTAGE GAIN: 25 MIN

NOTE:

(1) SUPPLY VOLTAGE EQUAL TO OR LESS THAN 15 V.

TP5-2289-013

Quad Operational Amplifier 351-1141-030
 Figure 7



CHARACTERISTICS

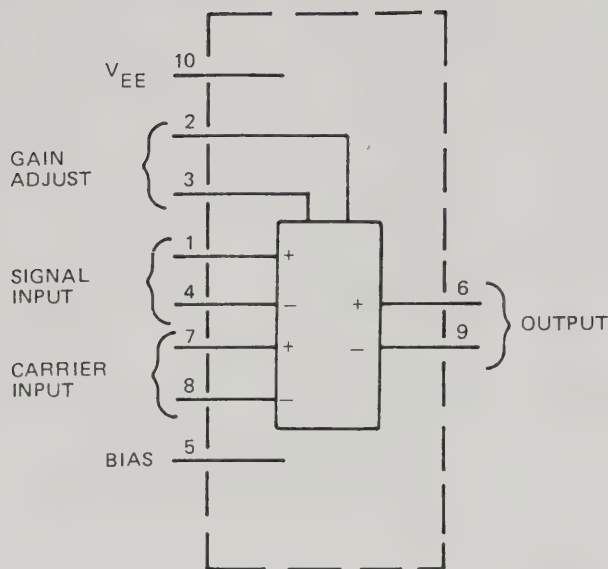
SUPPLY VOLTAGE (V+): 18 V DC MAX
 INPUT DIFF VOLTAGE: 30 V DC MAX
 OUTPUT SHORT CIRCUIT DURATION:
 CONTINUOUS (1)
 VOLTAGE GAIN: 50 MIN

NOTE:

(1) POWER DISSIPATION OF 500 mV CANNOT BE EXCEEDED.

TPA-2899-011

Quad Operational Amplifier 351-1370-020
 Figure 8

**CHARACTERISTICS**

APPLIED VOLTAGE: 30 V DC MAX PIN-TO-IN.

DIFFERENTIAL INPUT VOLTAGE: ± 5 V DC MAX

CARRIER SUPPRESSION: 65 dB TYPICAL AT 0.5 MHz; 50 dB TYPICAL AT 10 MHz.

TRANSADMITTANCE BANDWIDTH:
CARRIER INPUT-300 MHz TYPICAL;
SIGNAL INPUT-80 MHz TYPICAL

SINGLE-ENDED INPUT RESISTANCE (SIGNAL INPUT): 200 k OHM TYPICAL (AT 5.0 MHz)

SINGLE-ENDED INPUT RESISTANCE (SIGNAL INPUT): 40 k OHM TYPICAL (AT 10 MHz)

DIFFERENTIAL OUTPUT VOLTAGE SWING:
8.0 V P-P TYPICAL

TP5-2291-011

Balanced Modulator-Demodulator 351-0043-020
Figure 9

2.9 Dual Comparator 351-1166-010 (Refer to figure 10.)

The 351-1166-010 consists of two independent comparators. Each is high speed, requires low input current, and has an open-collector output. The comparators are compatible with RTL, DTL, and TTL, and capable of handling up to 25 mA at the output.

3. TESTING/TROUBLESHOOTING PROCEDURES

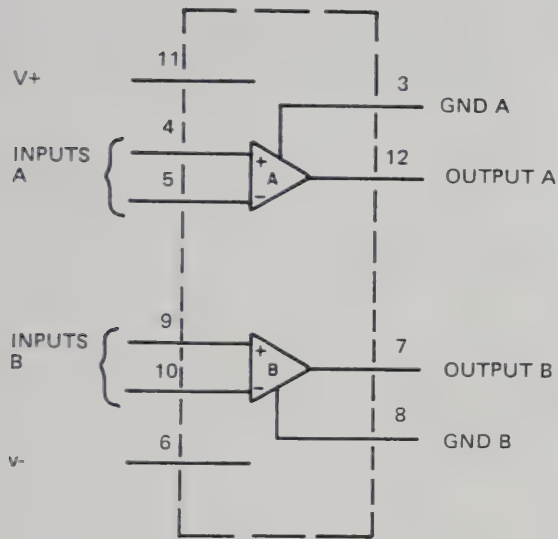
3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the channel A1 i.f. card are

listed in the maintenance section of this instruction book.

3.2 Testing

Test procedures in table 2 check total performance of the channel A1 i.f. card. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.



CHARACTERISTICS

SUPPLY VOLTAGE: V+ +18 V MAX;
V- -25 V MAX; 36 V MAX TOTAL
POWER DISSIPATION: 500 mW MAX
INPUT DIFF VOLTAGE: ± 5 V MAX
OUTPUT SHORT CIRCUIT DURATION:
10 SECONDS MAX
VOLTAGE GAIN: 10 MIN.

TPA-2900-011

Dual Comparator 351-1166-010
Figure 10

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit. Note Front panel control settings (at the beginning of each test) are listed only for those controls whose settings affect the test. Unlisted controls may be set in any position. b. Remove channel A1 i.f. card. Install it on extender card and place extender card in unit. Connect coax extender cables between card and unit. c. Set unit LINE SELECTOR switch to 115 V. Ensure that fuse is 2 A. d. Connect unit to 115-V ac power source and set PWR on. e. Measure dc voltages on card between following pins and ground: P4-23 P4-51 P4-6 P4-27	+15.0 $\pm$1.0 V dc +15.0 $\pm$1.0 V dc -15.0 $\pm$1.0 V dc +5.0 $\pm$0.5 V dc	Check associated power supply
2. Channel enable	a. Set CH A1 switch to OFF. Set MODE to ISB. b. Measure dc voltage between TP1 (brown) and ground. c. Set CH A1 switch to ON. d. Measure dc voltage between TP1 (brown) and ground. e. Set CH A1 switch to OFF. Set MODE to CW. f. Measure dc voltage between TP1 (brown) and ground. g. Set MODE to AM. h. Measure dc voltage between TP1 (brown) and ground. i. On rear panel of unit, temporarily ground MUTE terminal (TB1-10).	Not more than 0.5 V dc Not less than +12 V dc Not less than +12 V dc Not less than +12 V dc	Check U2C, Q5, and associated components. Check U2C, Q5, and associated components. Check CR4. Check CR3.
(Cont)			

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	j. Measure dc voltage between TP1 (brown) and ground. k. Remove ground from MUTE.	Not more than +0.5 V dc	Check U1A, Q1, and associated components.
3. I.f. sensitivity and gain	a. Set PWR off. b. Connect channel A1 i.f. card P1 to sig gen through 6-dB attenuator. c. Set PWR on, all AGC switches OFF, and RF GAIN to max cw. Set CH A1 to ON and others OFF. d. Set sig gen output to 1 μV (as shown on sig gen meter) and frequency to 9.4485 MHz. e. Connect distortion analyzer input to channel A1 AF OUT between balanced output terminals on rear panel. Connect 600-ohm resistor between same two terminals. f. Set reference level on distortion analyzer. g. Set analyzer mode to distortion and measure sensitivity of i.f. amplifier. h. Connect rf voltmeter through 50-ohm adapter to channel A1 IF OUT connector on rear panel. i. Set sig gen output level to 30 μV (as shown on sig gen meter). j. Set channel A1 AGC to FAST or DATA. k. Measure i.f. output level. IF SENSITIVITY AND GAIN TESTING COMPLETE ----- TROUBLESHOOTING l. Connect rf voltmeter through 50-ohm adapter to A1 IF OUT connector on rear panel. m. Set sig gen output level to obtain approx 25-mV output at IF connector. n. Adjust T1, T2, and L13 for peak output at IF connector. (L13 has two peaks. Use one giving greatest signal output.) o. Set sig gen to 10.351 MHz.	Not less than 10 dB 25 $\pm$ 5 mV	Proceed to step 1. Proceed to step u. If signal not adjustable or not present, signal trace to find malfunctioning stage.
(Cont)			

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	p. Adjust C3 and C5 to null output at IF connector. (C3 and C5 have two nulling positions. Use position giving greatest nulls.) Increase sig gen output as necessary to detect sharp nulls. q. Set sig gen to 9.448 MHz. r. Adjust T1 for peak output at IF connector. Change sig gen output as necessary. s. Set MODE to AM and BANDWIDTH to 16. t. Adjust L7 for peak output at IF connector. Repeat step g. u. Inhibit rf (turn off or disconnect) to P1. v. Using rf voltmeter with high-z probe, monitor 9.9-MHz leakage at P3. Adjust R8 to null 9.9-MHz signal level. w. Set sig gen output level to 10 mV at 9.4485 MHz. x. Monitor rf voltage at P3 (with high-z probe) while adjusting R19 to obtain 28 mV rf. y. Measure and record rf voltage at P3. z. Measure rf voltage at Q9-d. aa. Set MODE to AM and BANDWIDTH to 16. ab. Measure and record rf voltage at P3. ac. Measure rf voltage at Q9-d. ad. Set MODE to ISB. ae. Set sig gen output level to 10 μV. Switch off AM function.	Min output level 2.5 times that recorded in step y 2.5 times that recorded in step ab	Check circuit between Q1 and U1. If R19 does not control voltage, check Q1, Q4, U1, and associated components. Adjust R39 as necessary. Check Q8, Q9, FL1, and associated components. Adjust R43 as necessary. Check Q10, Q11, and associated components.
(Cont)	af. Record dB level at P1-21.		

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	ag. Reduce sig gen output to 3.2 μ V. Monitor dc V at P1-21 while adjusting R59 to obtain 6 dB less than recorded in step af. ah. Increase sig gen output to 10 mV. ai. Adjust R136 to obtain +5.0 V dc at P1-21. aj. Repeat steps i, j, and k.		If R59 does not control voltage, check Q14/Q15, Q16, Q17/Q18, and associated components. If R136 does not allow voltage to be properly adjusted, perform AGC tests then repeat test 3.
4. I.f. selectivity	a. Refer to test 3 and perform equipment setup given in steps a through f, except connect audio voltmeter and 600-ohm resistor between P4-34 and ground. Set RF GAIN to max cw and CH A1 AGC to OFF. Remove receive audio circuit cards from unit. b. Set distortion analyzer to audio voltmeter mode. c. Vary sig gen frequency to obtain peak audio output voltage. Record frequency. Set output level for 10-mV audio output. d. Adjust distortion analyzer reference level for 0-dB indication. e. Adjust sig gen frequency above and below frequency recorded in step c until voltmeter indication is 1 dB less than set in step d. Note frequencies (in MHz). f. Set sig gen frequency to center frequency. Increase sig gen output level 60 dB greater than that set in step c. g. If necessary, readjust distortion analyzer for 0-dB indication. h. Adjust sig gen frequency above and below center freq until voltmeter indication is 1 dB less than set in step g. Note frequencies (in MHz).	Max low frequency = 9.446 90 Min high frequency = 9.449 75 Min low frequency = 9.446 45 Max high frequency = 9.450 25	Check filter FL1. Check filter FL1.
5. Audio output (Cont)	a. Connect channel A1 i.f. card P1 to sig gen through 6-dB attenuator. b. Set sig gen frequency to 9.4485 MHz.		

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	c. Set sig gen output to 30 μV. d. Set CH A1 AGC to FAST or DATA and RF GAIN to max cw position. e. Temporarily connect 600-ohm resistor and audio voltmeter between P4-34 and ground. f. Measure audio output at P4-34. g. Set MODE to AM and BANDWIDTH to 16. h. Set sig gen for 50% AM (1000 Hz) at 30-μV output. i. Connect 600-ohm resistor between P4-8 and measure audio output. j. Disconnect setup from P4-8 and -34. Turn off PWR. Replace receive audio cards. Turn on PWR.	10 $\pm$ 1 mV ac 10 $\pm$ 1 mV ac	Set sig gen output to 30 μV. Adjust R95 to obtain 10 mV at P4-34. If R95 does not control signal, check P5 for 450 kHz at 7 $\pm$ 1 dB mW. Check Q19, U4, and associated components. Set sig gen output to 30 μV. Adjust R145 to obtain 10 mV at P4-8. If R145 does not control signal, check U5, U27, and associated components.
6. AGC output voltage (Cont)	a. Refer to test 3 and perform equipment setup given in steps a through d. b. Set applicable CH A1 AGC to FAST or DATA and RF GAIN to max cw position. c. Set sig gen frequency to 9.4485 MHz and output level to 100 μV. d. Measure voltage at P4-21.	+0.90 $\pm$ 0.2 V dc	Adjust R59 as necessary. If R59 adjusted, perform test 3. If R59 does not adjust level, check U2, U5, U6, and associated components.

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

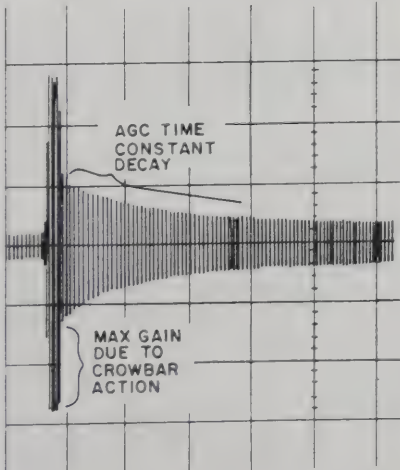
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																								
6. (Cont)	e. Set sig gen output level to 10 mV. f. Measure voltage at P4-21. g. Measure voltage at P4-18.	+5.0 ±0.1 V dc +3.0 ±0.1 V dc (Voltage at P4-21 should be 5.0 V. Adjust RF GAIN to obtain +5 V if necessary.)	Check U6B/C/D, Q22, Q23, and associated components. Adjust R140 as necessary. If R140 does not adjust level, check Q24/Q25 and associated components, or replace R138 from test selected values of 820 Ω, 1000 Ω, 1200 Ω, 1500 Ω or 1800 Ω. If R138 replaced, repeat tests 3 and 6.																								
7. AGC time constants	a. Disconnect sig gen and 6-dB attenuator from P1 on chan A1 i.f. card. Connect sig gen and 6-dB attenuator to signal input of rf signal level switch. Connect switch output to P1 on i.f. card. b. Connect 30 dB of attenuation to rf signal level switch attenuator connectors. c. Connect scope trigger to rf signal level switch trigger output. Connect scope vertical input to channel A1 IF output connector on rear panel. d. Apply dc voltage (+15 to +28 V) to rf signal level switch. e. Set sig gen output level to 1.0 mV. f. While observing scope, depress and release level switch and measure AGC attack and decay times.  AGC TIME CONSTANT DECAY MAX GAIN DUE TO CROWBAR ACTION SIGNAL RESPONSE INCLUDING CROWBAR ACTION	As indicated for applicable card: 638-6871-001 <table><tr><th>AGC TC</th><th>*ATTACK</th><th>DECAY</th></tr><tr><td>DATA</td><td>10 ms max</td><td>15 to 30 ms</td></tr><tr><td>VOICE</td><td>10 ms max</td><td>1 to 2.2 s</td></tr><tr><td>FAX</td><td>1 s max</td><td>3 to 6 s</td></tr></table> 638-6871-002 <table><tr><th>AGC TC</th><th>*ATTACK</th><th>DECAY</th></tr><tr><td>FAST</td><td>10 ms max</td><td>15 to 30 ms</td></tr><tr><td>SLOW</td><td>10 ms max</td><td>1 to 2.2 s</td></tr><tr><td>MED</td><td>10 ms max</td><td>70 to 150 ms</td></tr></table> *Measured when signal is within 3 dB of steady state level.	AGC TC	*ATTACK	DECAY	DATA	10 ms max	15 to 30 ms	VOICE	10 ms max	1 to 2.2 s	FAX	1 s max	3 to 6 s	AGC TC	*ATTACK	DECAY	FAST	10 ms max	15 to 30 ms	SLOW	10 ms max	1 to 2.2 s	MED	10 ms max	70 to 150 ms	Proceed to step h.
AGC TC	*ATTACK	DECAY																									
DATA	10 ms max	15 to 30 ms																									
VOICE	10 ms max	1 to 2.2 s																									
FAX	1 s max	3 to 6 s																									
AGC TC	*ATTACK	DECAY																									
FAST	10 ms max	15 to 30 ms																									
SLOW	10 ms max	1 to 2.2 s																									
MED	10 ms max	70 to 150 ms																									
(Cont)																											

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)	g. Set unit AGC time constant switch to other positions, repeating step f for each position. AGC TIME CONSTANTS TESTING COMPLETE TROUBLESHOOTING h. To adjust decay time, perform steps i through l. If rise time faulty, go to step m. i. Set sig gen output level to 300 μV. Adjust rf signal level switch attenuator for 4 dB of attenuation. j. Connect scope vertical input to U2-7. k. Depress level switch and permit output to scope to stabilize. l. Observe scope and release level switch. m. No adjustable components are included for rise time. For all rise times other than FAX, check C84 and associated components. For FAX rise time malfunctions, check C86.	U2-7 just starts to switch positive toward end of sweep.	Adjust R166 as necessary. (When correctly adjusted, U2-7 will switch on 4-dB decrease but will not switch on 3-dB increase.) If R166 does not correct decay time and decay is incorrect for SLOW/VOICE time constant, check U3D, Q31, Q33, U2B, and associated components. If decay is incorrect for FAST/DATA or MED/FAX time constants, check U3A, Q34, Q20, U2A, and associated components.
8. AGC crowbar (Cont)	a. Connect variable attenuator to rf signal level switch attenuator connectors. Set attenuation to 30 dB. b. Set sig gen output level to 10 mV and frequency to 9.4485 MHz.		

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

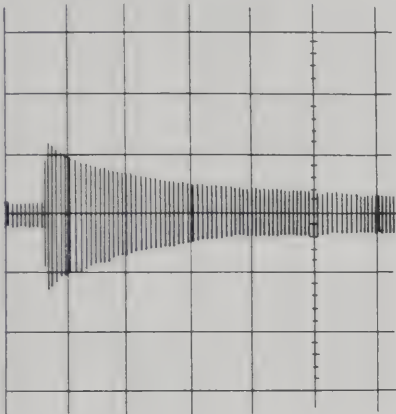
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	c. Depress and release level switch and observe scope display for crowbar action.  SIGNAL RESPONSE WITHOUT CROWBAR ACTION TPA-3069-011 d. Decrease attenuation, then repeat step c. Continue until crowbar action no longer occurs. e. Note attenuation just before crowbar action ceases to occur. f. Set MODE to NET DATA and AGC to FAST or DATA. g. Observe scope while momentarily applying a +5-V logic 1 to P4-33, simulating an end-of-message signal. h. Set MODE to position other than NET DATA. i. Repeat step g. Note To check TADIL A crowbar operation, use the SA-1914/TSC-60(V) Radio Frequency Switching Unit. j. Set MODE to NET DATA, AGC to FAST or DATA, and RF GAIN to max cw position.	20 $\pm$ 3 dB I.f. output momentarily limits as circuit crowbars. I.f. output does not limit.	Check U2D, Q30, and associated components. Check U7B, U2D, Q30, and associated components. Check U7B and associated components.
(Cont)			

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

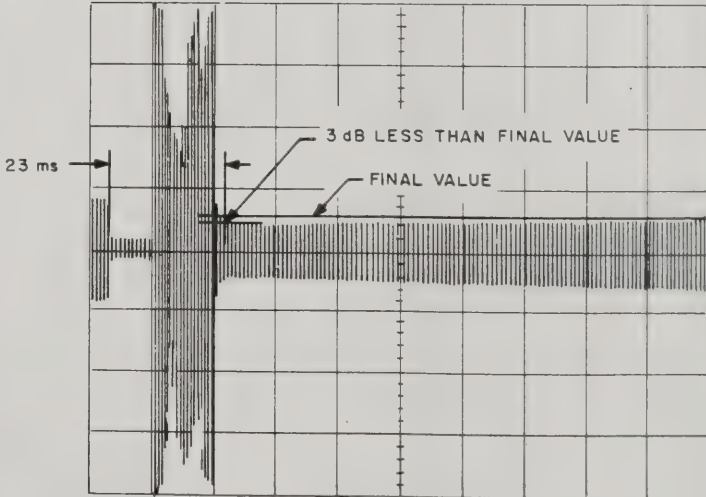
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	k. Connect two sig gens to SA-1914 RF1 IN and RF2 IN. Set RF1 sig gen to 9.451 MHz and RF2 sig gen to 9.452 MHz. l. Connect SA-1914 RF OUT directly to channel A1 i.f. card P1. m. Connect SA-1914 TRIG OUT to scope trigger and scope vertical input to P4-34 (SSB AF output), or to channel A1 IF OUT jack on rear panel. n. Set SA-1914 MODE SELECTOR to RF 2 OFF. o. Set RF1 sig gen output level to 10 mV and RF2 sig gen output level to 10 μV. p. Adjust scope so sweep is just below trigger threshold. (Sweep speed approx 0.5 s/div.) q. Set MODE SELECTOR to RF1 OFF and observe audio output on scope.	Audio output is within 3 dB of final level within 23 ms after sig gen rf out switched off.	
	 TADIL A CROWBAR ACTION TPA-3070-011		
	r. Set both sig gen output levels to 3 mV. s. Repeat step q. t. Disconnect test setup.	Same as step q.	

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. AGC off	a. Connect sig gen and 6-dB attenuator to P1. Set sig gen frequency to 9.4485 MHz. b. Set sig gen output to 10 mV. c. Connect scope to P4-34. d. Observe scope display and switch CH A1 AGC to OFF.	Signal level increases due to no AGC action.	Check U3A, U3F, and associated components.
10. AGC performance monitor	a. Turn off sig gen rf. b. Monitor dc voltage at TP5 (A1 AGC PM) and slowly decrease RF GAIN to point where voltage at TP5 goes less than +1.0 V (logic 0). c. Measure AGC signal voltage at P4-21.	Not more than +0.7 V dc	Check Q21 and associated components.
11. Rf performance monitor	a. Set RF GAIN to max cw position. b. Turn on sig gen rf output. c. Change sig gen output level to level at which voltage at TP2 just switches to logic 0. d. Note sig gen output level.	Not more than 1.0 V rms	Check Q2 and associated components.
12. Rf gain and meter bus	a. Turn off sig gen rf. b. Set AGC to OFF and RF GAIN to max ccw position. Set METER to RCV SIG. Select MODE other than NET DATA. c. Adjust RF GAIN to obtain $+4.0 \pm 0.5$ V dc to P4-39. d. Measure dc V at P4-21. e. Measure dc V at P4-40. f. Adjust RF GAIN to obtain $+5.0 \pm 0.05$ V at P4-12. g. Observe front panel meter.	Not less than +8 V dc 4 ± 0.2 V dc Full-scale	Check U6D and associated components. Check CR10. Adjust R120, as necessary, for full-scale. (R120 is to be set to produce 63 ± 1 mV across 100 ohms at P4-12.)

(Cont)

Table 2. Channel A1 IF, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																					
12. (Cont)	Note Steps h thru k can be performed only if HF-8094() is connected to HF-8054(). h. Set HF-8054() CONT to REM. i. Adjust HF-8094() RF GAIN to obtain -4.0 ±0.5 V dc at HF-8054() P4-11. j. Measure dc V at HF-8054() P4-21. k. Set HF-8054() CONT to LCL.	+4 ±0.1 V dc	If R120 ineffective, check CR20 and meter. Check U6D and associated components.																					
13. Filter enable inputs	a. Set MODE to AM. Set BANDWIDTH switch to each listed position and measure indicated pins for logic 1. (All other pins should be logic 0.) <table><thead><tr><th>POSITION</th><th>PINS</th><th>LOGIC</th></tr></thead><tbody><tr><td>16</td><td>P4-42, J10-3</td><td>1</td></tr><tr><td>A</td><td>P4-15, J10-4</td><td>1</td></tr><tr><td>B</td><td>P4-43, J8-2</td><td>1</td></tr><tr><td>C</td><td>P4-16, J8-3</td><td>1</td></tr><tr><td>D</td><td>P4-45, J8-5</td><td>1</td></tr><tr><td>E</td><td>P4-17, J8-4</td><td>1</td></tr></tbody></table> b. Set MODE to CW and repeat measurements for each BANDWIDTH switch position. c. Tests completed. Turn off power. Disconnect all test equipment and reinstall circuit card in unit.	POSITION	PINS	LOGIC	16	P4-42, J10-3	1	A	P4-15, J10-4	1	B	P4-43, J8-2	1	C	P4-16, J8-3	1	D	P4-45, J8-5	1	E	P4-17, J8-4	1	Same as for step a.	Check BANDWIDTH switch. Check circuit card connector terminals.
POSITION	PINS	LOGIC																						
16	P4-42, J10-3	1																						
A	P4-15, J10-4	1																						
B	P4-43, J8-2	1																						
C	P4-16, J8-3	1																						
D	P4-45, J8-5	1																						
E	P4-17, J8-4	1																						

4. REPAIR

Repair of the control card is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

5. PARTS LIST/DIAGRAMS

5.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 11). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

5.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the **DESCRIPTION** column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the **EFFECTIVITY** column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc.). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

CODE	MANUFACTURER'S NAME AND ADDRESS
00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
00872	TELEDYNE SYSTEMS CO MICROELECTRONICS DIV 12964 PANAMA ST LOS ANGELES CA 90066
02111	SPECTROL ELECTRONICS CORP SUB OF CARRIER CORP 17070 E GALE AVE CITY OF INDUSTRY CA 91745
02113	COILCRAFT INC 1102 SILVER LAKE RD CARY IL 60013
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042

CODE MANUFACTURER'S NAME
AND ADDRESS

09021 AIRCO ELECTRONICS
 FOSTER BROOK RD
 P O BOX 334
 BRADFORD PA 16701

12040 NATIONAL SEMICONDUCTOR CORP
 COMMERCE DR
 P O BOX 443
 DANBURY CT 06810

13499 ROCKWELL INTERNATIONAL CORP
 COLLINS TELECOMMUNICATIONS
 PRODUCTS DIV
 PO BOX 728
 855 35TH STREET NE
 CEDAR RAPIDS IA 52406

15818 TELEDYNE SEMICONDUCTOR
 1300 TERRA BELLA AVE
 MOUNTAIN VIEW CA 94043

17856 SILICONIX INC
 2201 LAURELWOOD RD
 SANTA CLARA CA 95054

18796 ERIE TECHNOLOGICAL PRODUCTS INC
 STATE COLLEGE DIV
 1900 W COLLEGE AVE
 STATE COLLEGE PA 16801

27014 NATIONAL SEMICONDUCTOR CORP
 2900 SEMICONDUCTOR DR
 SANTA CLARA CA 95051

28480 HEWLETT-PACKARD CO CORPORATE HQ
 1501 PAGE MILL RD
 PALO ALTO CA 94304

56289 SPRAGUE ELECTRIC CO
 NORTH ADAMS MA 01247

72136 ELECTRO MOTIVE CORP SUSSIDIARY OF
 INTERNATIONAL ELECTRONICS CORP
 LAUTER AVE
 P O BOX 7600
 FLORENCE SC 29501

72982 ERIE TECHNOLOGICAL PRODUCTS INC
 644 W 12TH ST
 ERIE PA 16512

74970 JOHNSON E F CO
 299 10TH AVE S W
 WASECA MN 56093

80294 BOURNS INC
 INSTRUMENT DIV
 6135 MAGNOLIA AVE
 RIVERSIDE CA 92506

81349 MILITARY SPECIFICATION

81483 INTERNATIONAL RECTIFIER
 9220 SUNSET BLVD
 P O BOX 2321 TERMINAL ANNEX
 LOS ANGELES CA 90054

93790 CORNELL-DUBILIER ELECTRONICS
 DIV FEDERAL PACIFIC ELECTRIC CO
 1605 RODNEY FRENCH BLVD
 NEW BEDFORD MA 02741

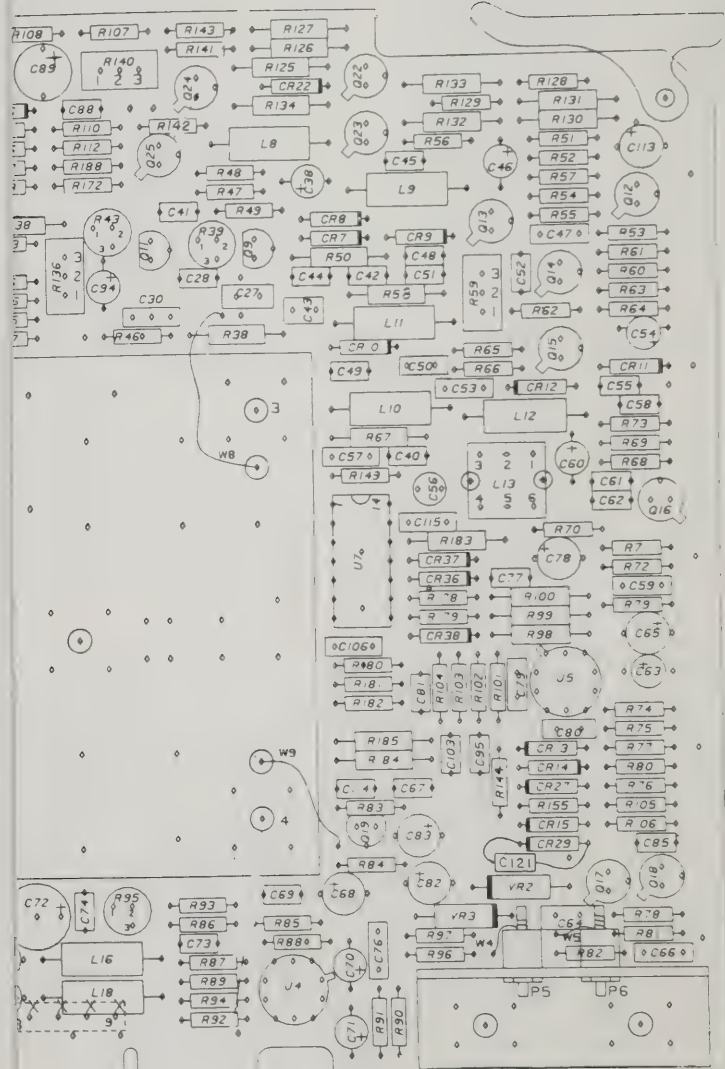
96906 MILITARY STANDARD

98091 SEAELECTRO CORP
 225 HOYT
 MAMARONECK NY 10544

5.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

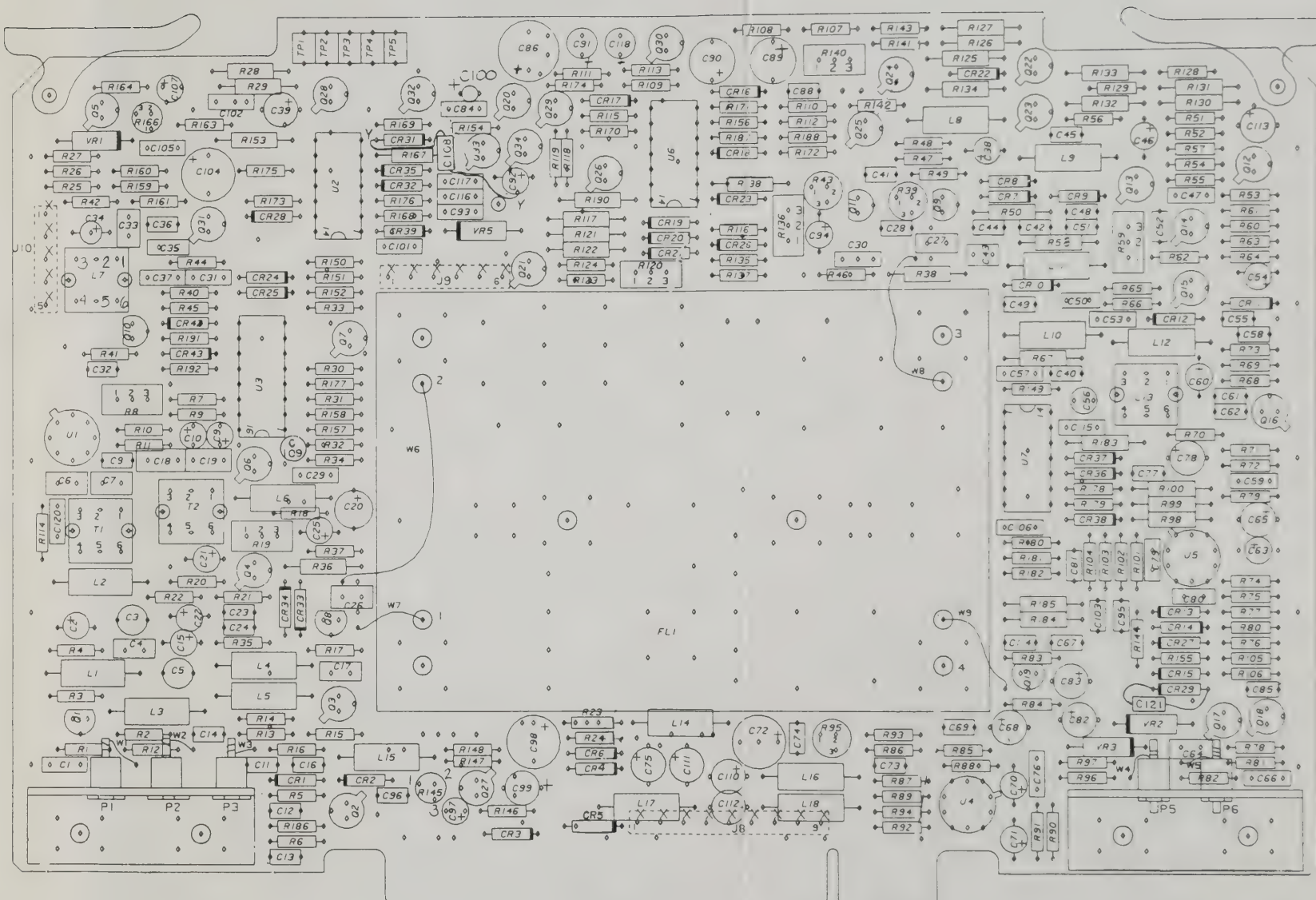
<u>UNIT/SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
CHANNEL A1 IF	638-6871-001	REV G
CHANNEL A1 IF	638-6871-002	REV G



CAUTION CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2497-018

Channel A1 IF, Schematic Diagram
Figure 11 (Sheet 1 of 6)



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2497-018

Channel A1 IF, Schematic Diagram
Figure 11 (Sheet 1 of 6)

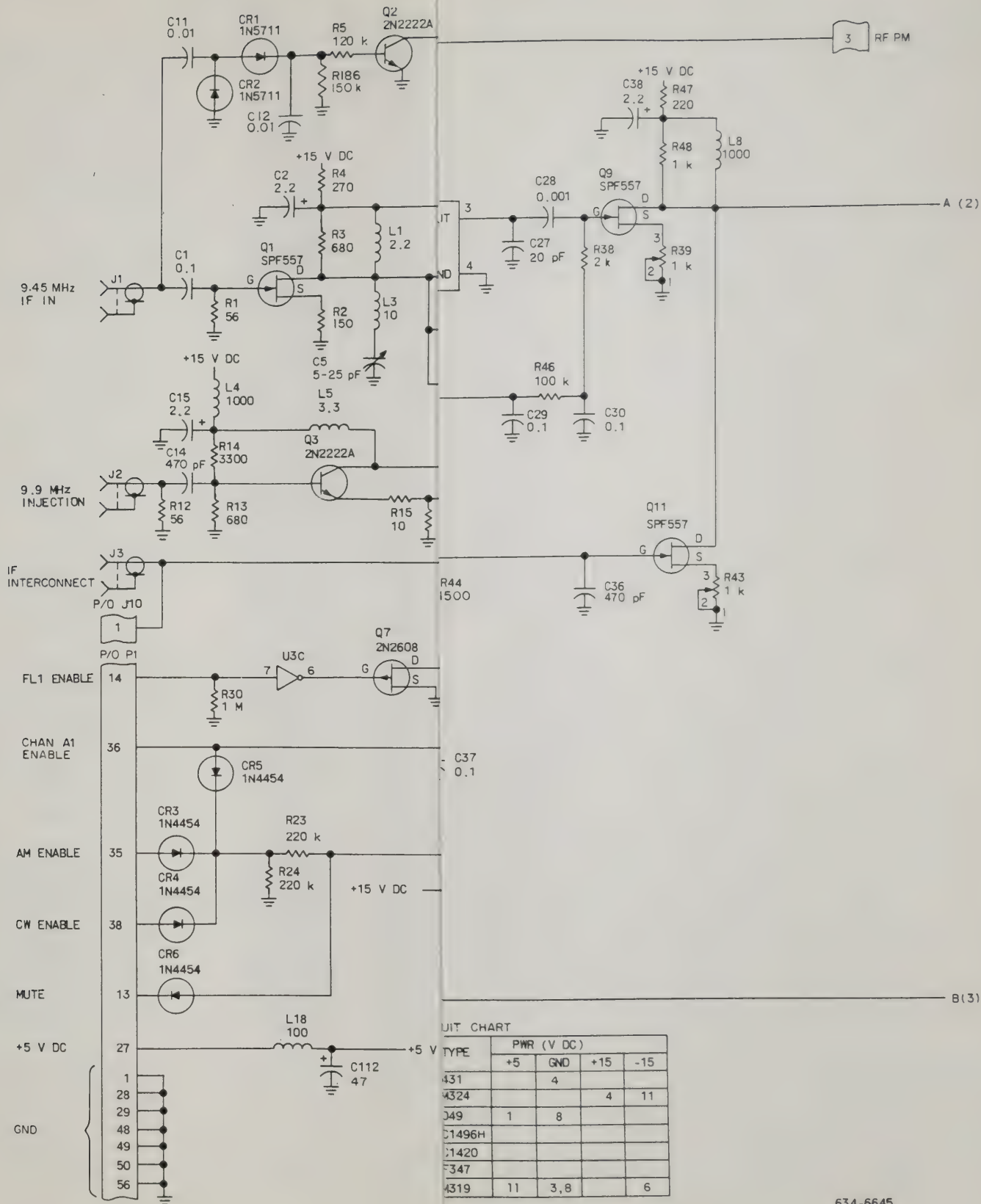
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	M PA	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	CHANNEL A1 IF (ESDS)	638-6871-001 A				81349	RCR05G271KS	
	CHANNEL A1 IF (ESDS)	638-6871-002 B				81349	RCR05G124KS	
CR1,CR2	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1M-000	81349	RCR05G104KS	
CR3-CR6	SEMICONV DEVICE	353-3644-010		03508	1M-000	81349	RCR05G562KS	
CR7	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1M-440	02111	64W202	
CR8,CR9	SEMICONV DEVICE	922-6119-010		28480	1M-000	81349	RCR05G562KS	
CR10	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1M-000	81349	RCR05G104KS	
CR11	SEMICONV DEVICE	922-6119-010		28480	1M-000	81349	RCR05G392KS	
CR12	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1M-000	81349	RCR05G560KS	
CR13,	SEMICONV DEVICE	353-3644-010		03508	1M-000	81349	RCR05G681KS	
CR14						81349	RCR05G332KS	
CR15,	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1M-000	81349	RCR05G100KS	
CR16						81349	RCR05G101KS	
CR17-	SEMICONV DEVICE	353-3644-010		03508	1M-000	81349	RCR05G221KS	
CR25						81349	RCR05G151KS	
CR26	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1M-430	02111	64W102	
CR27,	SEMICONV DEVICE	353-3644-010		03508	1M-000	81349	RCR05G222KS	
CR28						81349	RCR05G102KS	
CR29	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1M-000	81349	RCR05G562KS	
CR30	NOT USED					81349	RCR05G224KS	
CR31,	SEMICONV DEVICE	353-3644-010		03508	1M-000	81349	RCR05G223KS	
CR32						81349	RCR05G103KS	
CR33,	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1M-000	81349	RCR05G101KS	
CR34						81349	RN5508252F	
CR35-	SEMICONV DEVICE	353-3644-010		03508	1M-560	81349	RN5501502F	
CR39						81349	RCR05G105KS	
CR40,	NOT USED					81349	RCR05G154KS	
CR41						81349	RCR05G104KS	
CR42,	SEMICONV DEVICE	353-3644-010		03508	1M-000	81349	RCR05G271KS	
CR43						81349	RN5502001F	
C1	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK6-000	81349	RCR05G391KS	
C2	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-140	81349	RN5502001F	
C3	CAPACITOR,VAR CER DIEL, 5 TO 25PF, 100V	917-1256-030		72982	516-070	80294	3329HCT1-102	
C4	CAPACITOR,FXD MICA DIEL, 120PF, 5%, 50V	912-4141-380		93790	CD5-000	81349	RCR05G104KS	
C5	CAPACITOR,VAR CER DIEL, 5 TO 25PF, 100V	917-1256-030		72982	516-000	81349	RCR05G682KS	
C6,C7	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370		93790	CD4-000	81349	RCR05G102KS	
C8	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-070	80294	3329HCT1-102	
C9,C10	CAPACITOR,FXD TMTM ELCTLT, 4.7UF, 20%, 10V	184-9102-070		56289	199-000	81349	RCR05G152KS	
C11-C13	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK6-000	81349	RCR05G104KS	
C14	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK6-000	81349	RCR05G221KS	
C15	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	81349	RCR05G102KS	
C16	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK6-000	81349	RCR05G222KS	
C17	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790	CD5-000	81349	RN5501652F	
C18,C19	CAPACITOR,FXD CER DIEL, 2200PF, PORM5%, 100V	913-3281-300		18796	816-580	81349	RCR05G154KS	
C20	CAPACITOR,FXD TMTM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199-000	81349	RCR05G273KS	
C21,C22	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	81349	RCR05G122KS	
C23	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK6-000	81349	RCR05G121KS	
C24	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RCR05G680KS	
C25	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	81349	RCR05G271KS	
C26	CAPACITOR,FXD MICA DIEL, 9PF, PORM 0.5PF, 300V	912-4141-530		72136	DH3-000	81349	RCR05G222KS	
C27	CAPACITOR,FXD MICA DIEL, 20PF, PORM 0.5PF, 100V	912-4141-150		93790	CD5-460	81349	RN5509311F	
C28	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	02111	64W203	
C29-C31	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK6-000	81349	RCR05G154KS	
C32	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RCR05G273KS	
C33	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500		93790	CD5-000	81349	RCR05G122KS	
C34	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	81349	RCR05G271KS	
C35	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050		93790	CD5-000	81349	RCR05G222KS	
C36	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK6-000	81349	RCR05G121KS	
C37	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK6-000	81349	RCR05G680KS	
C38	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	81349	RN5501332F	
C39	CAPACITOR,FXD TMTM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199-000	81349	RCR05G333KS	
C40	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK6-000	81349	RCR05G184KS	
C41	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RCR05G822KS	
C42	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK6-000	81349	RCR05G101KS	
C43	CAPACITOR,FXD CER DIEL, 0.47UF, PORM10%, 50V	913-5019-520		81349	CK6-000	81349	RCR05G821KS	
C44	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK6-000	81349	RCR05G102KS	
C45	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RCR05G563KS	
C46	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	81349	RCR05G102KS	
C47	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK6-000	81349	RCR05G273KS	
C48	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RCR05G560KS	
C49	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK6-000	81349	RCR05G332KS	
C50	CAPACITOR,FXD CER DIEL, 0.47UF, PORM10%, 50V	913-5019-520		81349	CK6-000	81349	RCR05G391KS	
C51,C52	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RCR05G560KS	
C53	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK6-380	81349	RCR05G361JS	
C54	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	81349	RCR05G220KS	
C55	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RCR05G564KS	
C56	CAPACITOR,FXD CER DIEL, 0.39UF, PORM10%, 50V	913-5019-510		81349	CK6-000	81349	RCR05G102KS	
C57	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK6-000	81349	RCR05G682KS	
C58	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RCR05G103KS	
C59	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK6-000	81349	RCR05G101KS	
C60	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	81349	RCR05G103KS	
C61	CAPACITOR,FXD CER DIEL, 2200PF, PORM10%, 100V	913-5019-120		81349	CK6-000	81349	RCR05G102KS	
C62	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK6-080	81349	RCR05G332KS	
C63	CAPACITOR,FXD TMTM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	199-000	80294	3329HCT1-202	
C64	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-280		93790	CD5-000	81349	RCR05G101KS	
C65	CAPACITOR,FXD TMTM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199-000	81349	RCR05G680KS	
C66	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK6-000	81349	RN5502212F	
C67	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK6-000	81349	RN5501213F	
C68	CAPACITOR,FXD TMTM ELCTLT, 10UF, 20%, 20V	184-9102-610		56289	199-000	81349	RN5501003F	
C69	CAPACITOR,FXD CER DIEL, 150PF, 10%, 200V	913-4008-000		81349	CK6-000	81349	RCR05G124KS	

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PARTS LIST (Cont)

Channel A1 IF, Schematic Diagram
Figure 11 (Sheet 2)



634-6645

Channel A1 IF, Schematic Diagram
Figure 11 (Sheet 3)

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	N P
R102, R103	RESISTOR,FXD CHPSN, 12K, 10%, 1/8W	745-2380-000		81349	R
R104	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/8W	745-2359-000		81349	R
R105	RESISTOR,FXD CHPSN, 560K, 5%, 1/8W	745-1864-190		81349	R
R106	RESISTOR,FXD CHPSN, 56K, 10%, 1/8W	745-2404-000		81349	R
R107, R108	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	R
R109	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	R
R110	RESISTOR,FXD CHPSN, 10MEGO, 10%, 1/8W	745-1864-850		81349	R
R111	RESISTOR,FXD FILM, 8.2 OHMS, 5%, 1/4W	745-0910-150		09021	CI
R112	RESISTOR,FXD CHPSN, 820K, 10%, 1/8W	745-2446-000		81349	R
R113, R114	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	R
R115	RESISTOR,FXD CHPSN, 22K, 10%, 1/8W	745-2389-000		81349	R
R116	RESISTOR,FXD CHPSN, 18K, 10%, 1/4W	745-0794-000		81349	R
R117	RESISTOR,FXD FILM, 47.5K, 1%, 1/8W	705-3605-800		81349	R
R118	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	R
R119	RESISTOR,FXD CHPSN, 22K, 10%, 1/8W	745-2389-000		81349	R
R120	RESISTOR,VAR NON-WW,10K, 10%	382-0052-460		02111	64
R121	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	R
R122	RESISTOR,FXD FILM, 36.5K, 1%, 1/8W	705-1071-000		81349	R
R123, R124	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	R
R125	RESISTOR,FXD FILM, 37.4K, 1%, 1/8W	705-3605-750		81349	R
R126	RESISTOR,FXD FILM, 49.9K, 1%, 1/8W	705-3605-810		81349	R
R127	RESISTOR,FXD FILM, 36.5K, 1%, 1/8W	705-1071-000		81349	R
R128, R129	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	R
R130	RESISTOR,FXD FILM, 100K, 1%, 1/8W	705-1092-000		81349	R
R131	RESISTOR,FXD FILM, 9.09K, 1%, 1/8W	705-1042-000		81349	R
R132	RESISTOR,FXD FILM, 25.5K, 1%, 1/8W	705-3605-670		81349	R
R133	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	R
R134	RESISTOR,FXD FILM, 15K, 1%, 1/8W	705-3605-560		81349	R
R135	RESISTOR,FXD CHPSN, 330K, 10%, 1/8W	745-2431-000		81349	R
R136	RESISTOR,VAR NON-WW,20K, 10%	382-0052-470		02111	64
R137	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/8W	745-2359-000		81349	R
R138	RESISTOR,FXD CHPSN, 820 OHMS, 10%, 1/4W	745-0746-000		81349	R
R139	NOT USED				
R140	RESISTOR,VAR NON-WW,10K, 10%	382-0052-460		02111	64
R141	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W	745-2341-000		81349	R
R142	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	R
R143	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	R
R144	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	R
R145	RESISTOR,VAR 5K, 10%, 0.5W	382-0027-090		80294	33
R146	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/8W	745-2359-000		81349	R
R147	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/8W	745-2368-000		81349	R
R148, R149	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	R
R150	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	R
R151	RESISTOR,FXD CHPSN, 12K, 10%, 1/8W	745-2380-000		81349	R
R152	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	R
R153	RESISTOR,FXD FILM, 25.5K, 1%, 1/8W	705-3605-670		81349	R
R154	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	R
R155	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/8W	745-2317-000		81349	R
R156	RESISTOR,FXD CHPSN, 4.7MEGO, 10%, 1/8W	745-1864-810		81349	R
R157, R158	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	R
R159	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/8W	745-2353-000		81349	R
R160	RESISTOR,FXD CHPSN, 56K, 10%, 1/8W	745-2404-000		81349	R
R161	RESISTOR,FXD CHPSN, 180K, 10%, 1/8W	745-2422-000		81349	R
R162	NOT USED				
R163	RESISTOR,FXD CHPSN, 560K, 10%, 1/8W	745-2440-000		81349	R
R164	RESISTOR,FXG CHPSN, 47K, 10%, 1/8W	745-2401-000		81349	R
R165	NOT USED				
R166	RESISTOR,VAR 20K, 10%, 0.5W	382-0027-110		80294	33
R167	RESISTOR,FXD FILM, 11K, 1%, 1/8W	705-1046-000		81349	R
R168	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	R
R169	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	R
R170	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	R
R171	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/8W	745-2317-000		81349	R
R172	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	R
R173	RESISTOR,FXD CHPSN, 82K, 10%, 1/8W	745-2410-000		81349	R
R174	RESISTOR,FXD CHPSN, 220K, 10%, 1/8W	745-2425-000		81349	R
R175	RESISTOR,FXD CHPSN, 2.7MEGO, 5%, 1/8W	745-1864-350	A	81349	R
R176	RESISTOR,FXD CHPSN, 270K, 5%, 1/8W	745-1864-110		81349	R
R177	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	R
R178	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	R
R179	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	R
R180, R181	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	R
R182	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	R
R183	RESISTOR,FXD FILM, 121K, 1%, 1/8W	705-1096-000		81349	R
R184, R185	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	R
R186- R188	RESISTOR,FXD CHPSN, 560K, 5%, 1/8W	745-1864-190		81349	R
R189	NOT USED				
R190	RESISTOR,FXD FILM, 11K, 1%, 1/8W	705-1046-000		81349	R
R191, R192	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	R

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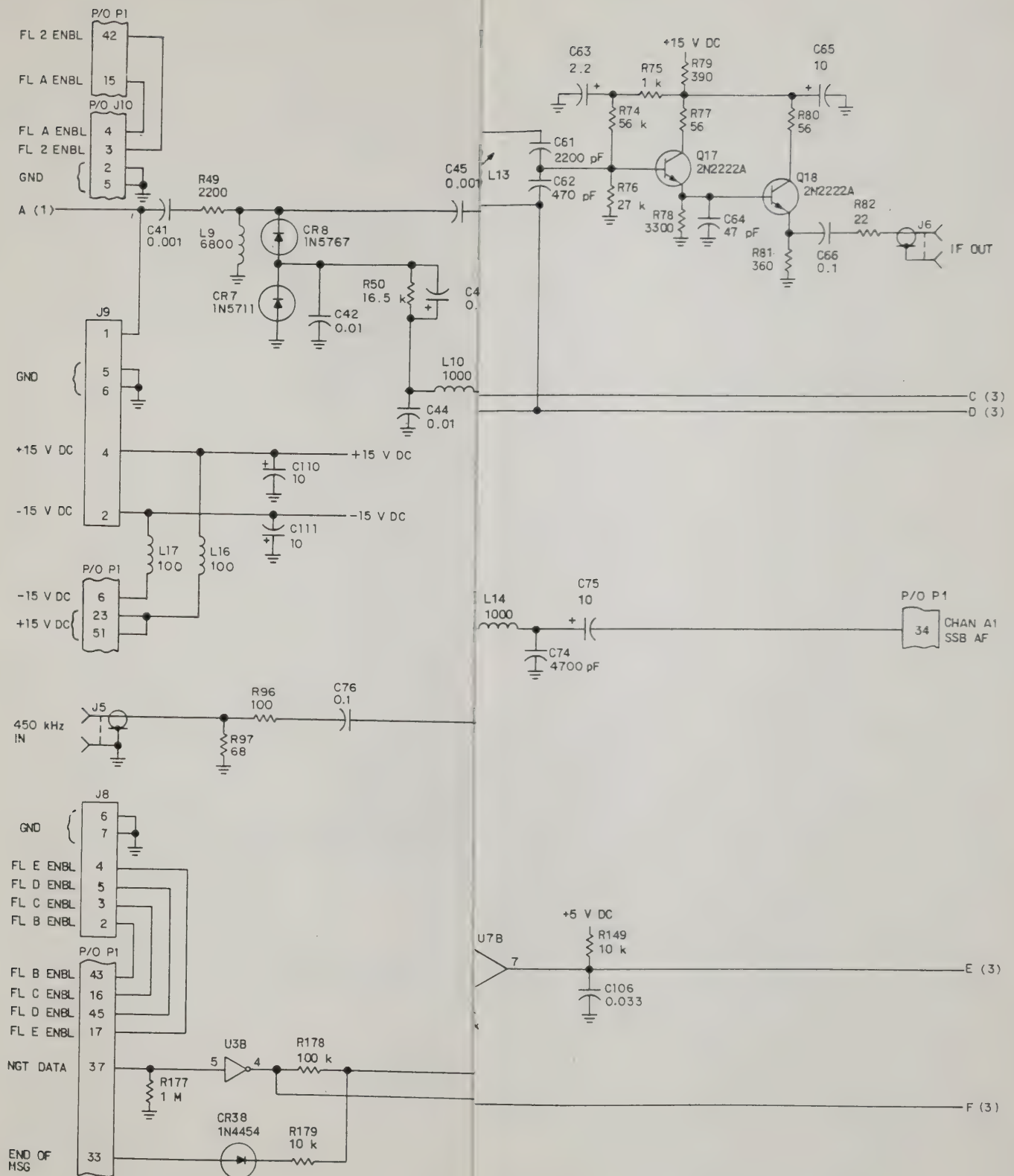
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PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R102.	RESISTOR,FXD CHPSN, 12K, 10%, 1/8W	745-2380-000		81349	RCR05G123KS
R103					
R104	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/8W	745-2359-000		81349	RCR05G332KS
R105	RESISTOR,FXD CHPSN, 560K, 5%, 1/8W	745-1864-190		81349	RCR05G564JS
R106	RESISTOR,FXD CHPSN, 56K, 10%, 1/8W	745-2404-000		81349	RCR05G563KS
R107.	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101KS
R108					
R109	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R110	RESISTOR,FXD CHPSN, 10MEGO, 10%, 1/8W	745-1864-850		81349	RCR05G106KS
R111	RESISTOR,FXD FILM, 8.2 OHMS, 5%, 1/4W	745-0910-150		09021	CF1-4-8R20J
R112	RESISTOR,FXD CHPSN, 820K, 10%, 1/8W	745-2446-000		81349	RCR05G824KS
R113.	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R114					
R115	RESISTOR,FXD CHPSN, 22K, 10%, 1/8W	745-2389-000		81349	RCR05G223KS
R116	RESISTOR,FXD CHPSN, 18K, 10%, 1/4W	745-0794-000		81349	RCR07G183KS
R117	RESISTOR,FXD FILM, 47.5K, 1%, 1/8W	705-3605-800		81349	RN55D4752F
R118	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R119	RESISTOR,FXD CHPSN, 22K, 10%, 1/8W	745-2389-000		81349	RCR05G223KS
R120	RESISTOR,VAR NON-WW,10K, 10%	382-0052-460		02111	64W103
R121	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F
R122	RESISTOR,FXD FILM, 36.5K, 1%, 1/8W	705-1071-000		81349	RN55D3652F
R123.	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R124					
R125	RESISTOR,FXD FILM, 37.4K, 1%, 1/8W	705-3605-750		81349	RN55D3742F
R126	RESISTOR,FXD FILM, 49.9K, 1%, 1/8W	705-3605-810		81349	RN55D4992F
R127	RESISTOR,FXD FILM, 36.5K, 1%, 1/8W	705-1071-000		81349	RN55D3652F
R128.	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R129					
R130	RESISTOR,FXD FILM, 100K, 1%, 1/8W	705-1092-000		81349	RN55D1003F
R131	RESISTOR,FXD FILM, 9.09K, 1%, 1/8W	705-1042-000		81349	RN55D9091F
R132	RESISTOR,FXD FILM, 25.5K, 1%, 1/8W	705-3605-670		81349	RN55D2552F
R133	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F
R134	RESISTOR,FXD FILM, 15K, 1%, 1/8W	705-3605-560		81349	RN55D1502F
R135	RESISTOR,FXD CHPSN, 330K, 10%, 1/8W	745-2431-000		81349	RCR05G334KS
R136	RESISTOR,VAR NON-WW,20K, 10%	382-0052-470		02111	64W203
R137	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/8W	745-2359-000		81349	RCR05G332KS
R138	RESISTOR,FXD CHPSN, 820 OHMS, 10%, 1/4W	745-0746-000		81349	RCR07G821KS
R139	NOT USED				
R140	RESISTOR,VAR NON-WW,10K, 10%	382-0052-460		02111	64W103
R141	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R142	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101KS
R143	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R144	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R145	RESISTOR,VAR 5K, 10%, 0.5W	382-0027-090		80294	3329HCT1-502
R146	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/8W	745-2359-000		81349	RCR05G332KS
R147	RESISTOR,FXD CHPSN, 5.6K, 10%, 1/8W	745-2368-000		81349	RCR05G562KS
R148.	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R149					
R150	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R151	RESISTOR,FXD CHPSN, 12K, 10%, 1/8W	745-2380-000		81349	RCR05G123KS
R152	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R153	RESISTOR,FXD FILM, 25.5K, 1%, 1/8W	705-3605-670		81349	RN55D2552F
R154	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R155	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/8W	745-2317-000		81349	RCR05G221KS
R156	RESISTOR,FXD CHPSN, 4.7MEGO, 10%, 1/8W	745-1864-810		81349	RCR05G475KS
R157.	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	RCR05G105KS
R158					
R159	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/8W	745-2353-000		81349	RCR05G222KS
R160	RESISTOR,FXD CHPSN, 56K, 10%, 1/8W	745-2404-000		81349	RCR05G563KS
R161	RESISTOR,FXD CHPSN, 180K, 10%, 1/8W	745-2422-000		81349	RCR05G184KS
R162	NOT USED				
R163	RESISTOR,FXD CHPSN, 560K, 10%, 1/8W	745-2440-000		81349	RCR05G564KS
R164	RESISTOR,FXD CHPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473KS
R165	NOT USED				
R166	RESISTOR,VAR 20K, 10%, 0.5W	382-0027-110		80294	3329HCT1-203
R167	RESISTOR,FXD FILM, 11K, 1%, 1/8W	705-1046-000		81349	RN55D1102F
R168	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R169	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R170	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R171	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/8W	745-2317-000		81349	RCR05G221KS
R172	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R173	RESISTOR,FXD CHPSN, 82K, 10%, 1/8W	745-2410-000		81349	RCR05G823KS
R174	RESISTOR,FXD CHPSN, 220K, 10%, 1/8W	745-2425-000		81349	RCR05G224KS
R175	RESISTOR,FXD CHPSN, 2.7MEGO, 5%, 1/8W	745-1864-350 A		81349	RCR05G275JS
R176	RESISTOR,FXD CHPSN, 270K, 5%, 1/8W	745-1864-110		81349	RCR05G274JS
R177	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	RCR05G105KS
R178	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R179	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R180.	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R181					
R182	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	RCR05G105KS
R183	RESISTOR,FXD FILM, 121K, 1%, 1/8W	705-1096-000		81349	RN55D1213F
R184.	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	RN55D6812F
R185					
R186-	RESISTOR,FXD CHPSN, 560K, 5%, 1/8W	745-1864-190		81349	RCR05G564JS
R188					
R189	NOT USED				
R190	RESISTOR,FXD FILM, 11K, 1%, 1/8W	705-1046-000		81349	RN55D1102F
R191.	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R192					

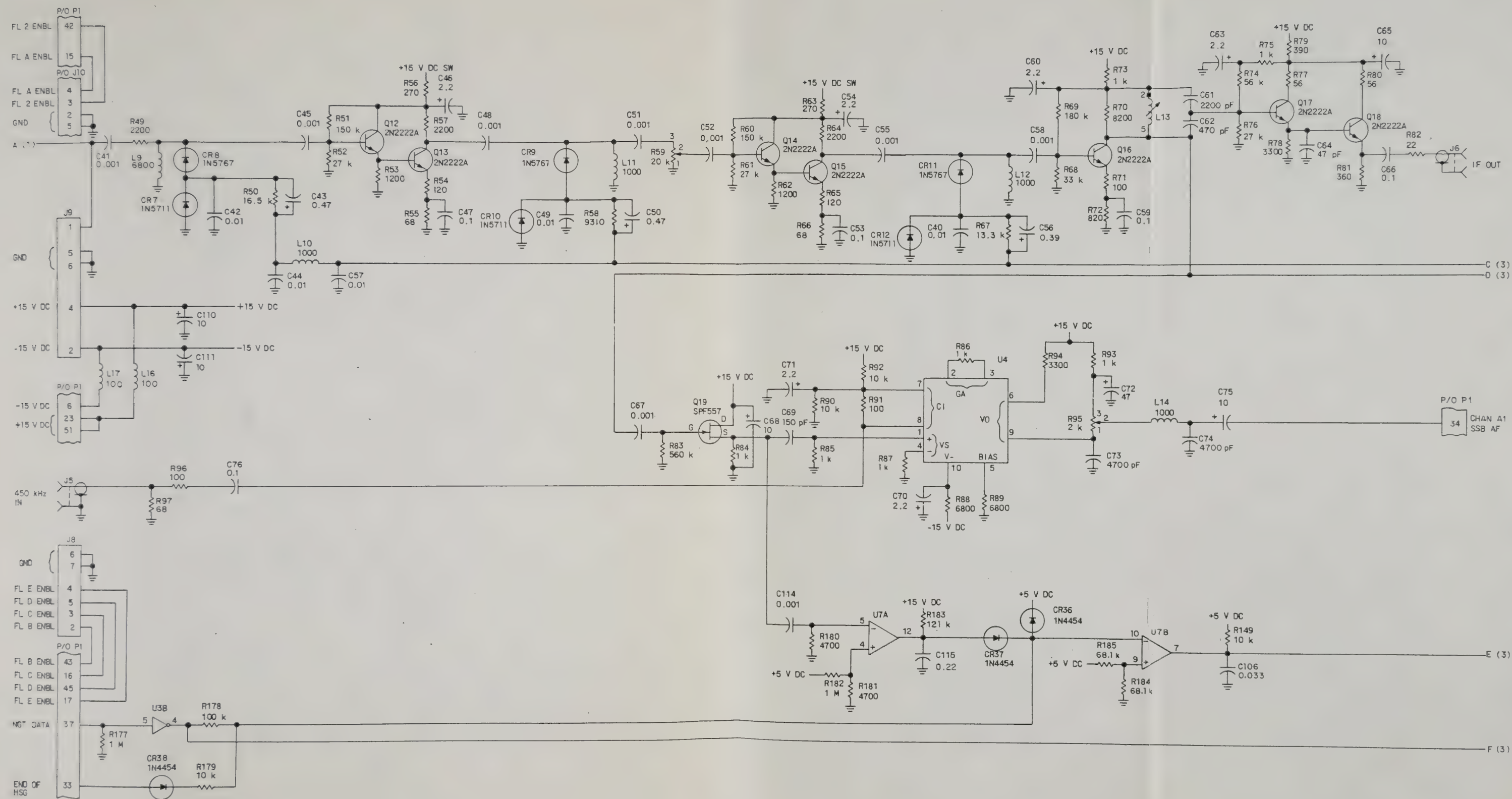
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
TP3	JACK,TIP ORN	360-0484-050		74970	105-1106-011
TP4	JACK,TIP YEL	360-0484-060		74970	105-1107-011
TP5	JACK,TIP GRN	360-0484-040		74970	105-1104-011
T1	TRANSFORMER,RF	278-0432-020		02113	278-0432-020
T2	TRANSFORMER,RF	278-0432-010		02113	278-0432-010
U1	TRANSISTOR	351-1151-010		17856	U431
U2	AMPLIFIER,QUAD	351-1141-030		12040	LM324N
U3	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049BPC
U4	INTEGRATED CIRCUIT	351-0043-020		04713	MC1496G
U5	INTEGRATED CIRCUIT	351-1050-030		04713	MC1420G
U6	INTEGRATED CIRCUIT OPRTNL AMPLIFIER,QUAD	351-1370-020		27014	LF347N
U7	INTEGRATED CIRCUIT	351-1166-010		27014	LM319N
VR1-VR3	SEMICONV DEVICE	353-2720-000		81483	1N756A
VR4	NOT USED				
VR5	SEMICONV DEVICE	353-3591-440		04713	1N4620



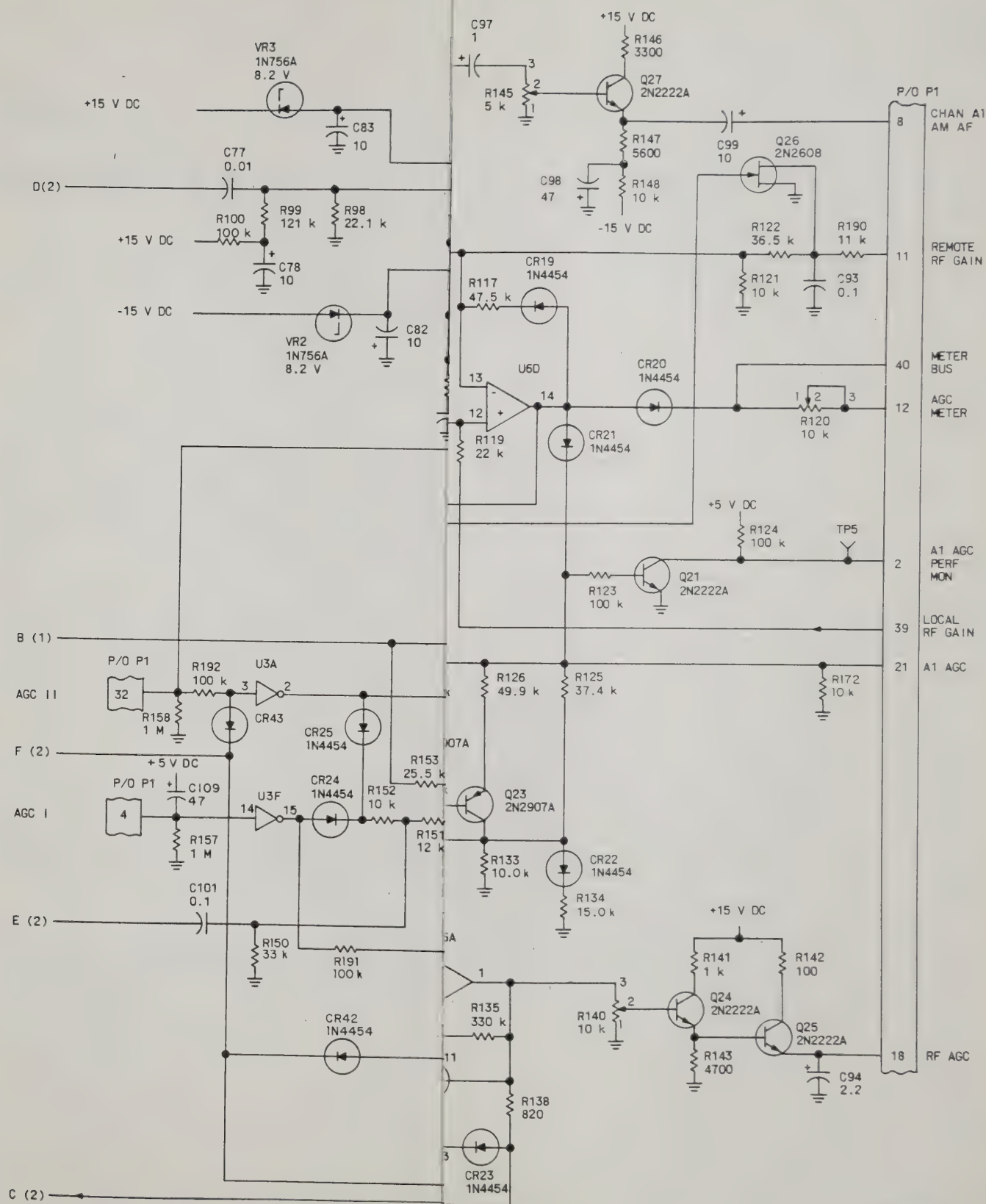
634-6645

Channel A1 IF, Schematic Diagram
Figure 11 (Sheet 5)



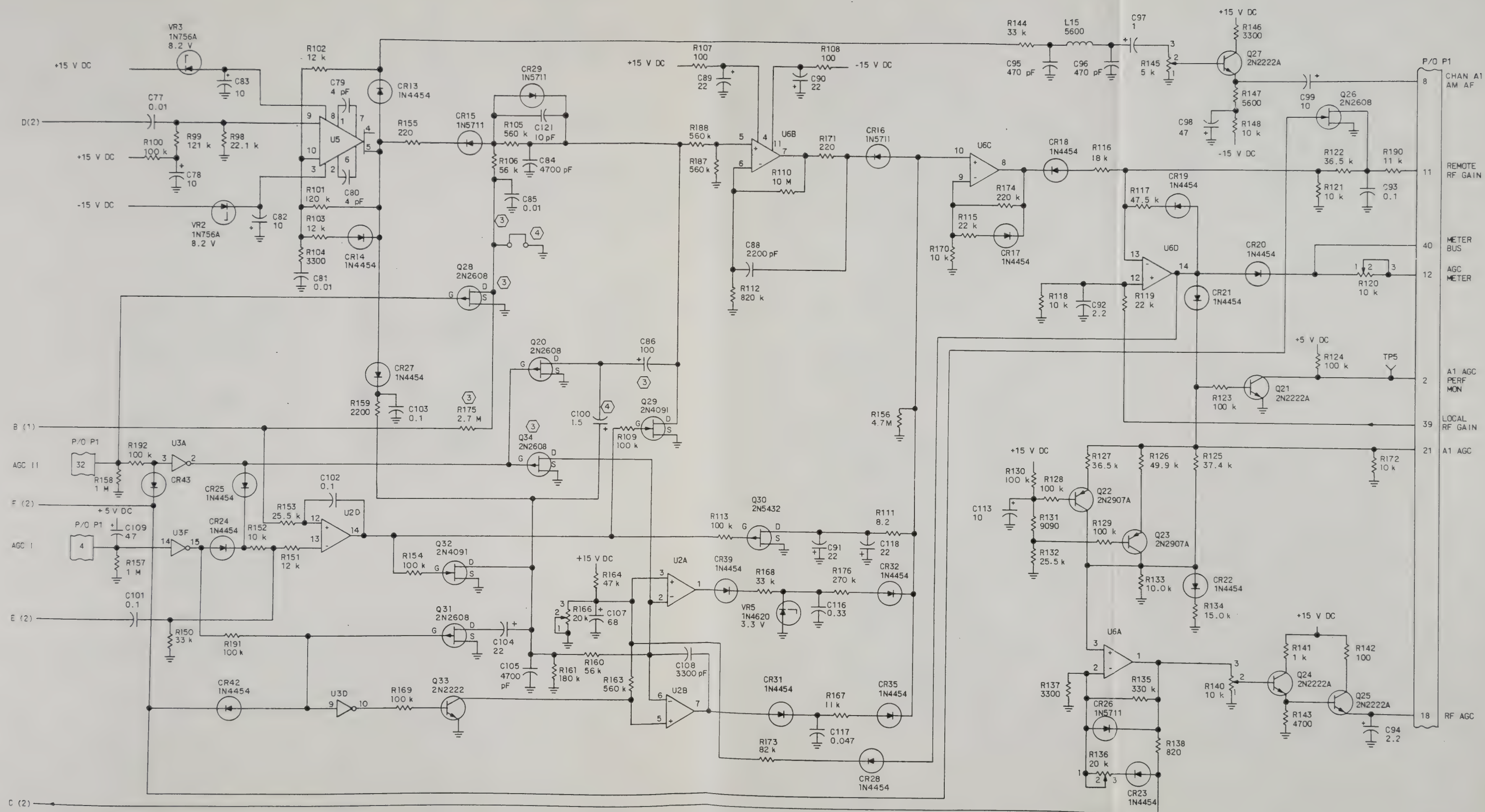
634-6645

Channel A1 IF, Schematic Diagram
Figure 11 (Sheet 5)



634-6645

Channel A1 IF, Schematic Diagram
Figure 11 (Sheet 6)



634-6645

Channel A1 IF, Schematic Diagram
Figure 11 (Sheet 6)



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0767967-004211

4th Edition, 1 October 1980

Filter

(637-2515-())

Printed in USA

Filter
(637-2515-())

1. DESCRIPTION

Filter 637-2515-(), shown in figure 1, is a 2-layer planar card with one 7-pin, one 6-pin, and one 5-pin blue-line connector. The filter card mates with a channel A if card and provides additional selectable filters.

The filter card consists of six filter circuits and a CW strapping circuit. Refer to table 1.

2. PRINCIPLES OF OPERATION (Refer to figure 4.)

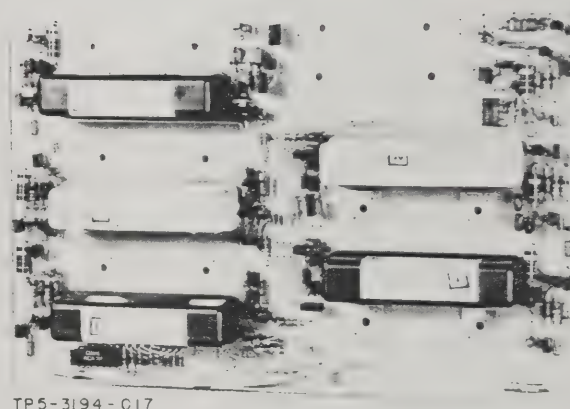
2.1 General

The filter card receives 450 kHz if from the channel A if card, makes filter selection as controlled by the FL2 through FL7, or CW mode switching inputs, and supplies 450-kHz filtered if to the channel A if card.

2.2 CW Mode Strapping

CW mode can be strapped to FL4, FL5, FL6, or FL7. To strap CW mode for the desired filter, CR11 is connected as follows:

- For FL4(B), connect CR11 anode to E1 and cathode to E2.
- For FL5 (C), connect CR11 anode to E1 and cathode to E3.
- For FL6 (D), connect CR11 anode to E1 and cathode to E4.
- For FL7 (E), connect CR11 anode to E1 and cathode to E5.



TP5-3194-C17

Filter
Figure 1

2.3 Bandpass Filter Control Circuits

The filter card provides filter selection of 450-kHz if signals. Filter selection is initiated by the CW mode control signal or by a bandwidth control signal. This means only that these signals are applied to the filter card to initiate filter selection and does not reflect a mode of operation or selection of a bandwidth.

FL2 (LSB), FL3 (A), FL4 (B), FL5 (C), FL6 (D), and FL7 (E) are selected when the associated enable signal is applied to the filter card. FL4 (B), FL5 (C), FL6 (D), and FL7 (E) can also be selected by CW mode signal when strapped as described in paragraph 2.2. These filters are optional and the following are typical frequency bandwidths.

NOTICE: This section replaces third edition dated 1 January 1979.

523-0767967-004211

Table 1. Filter Complement.

REF DES	COLLINS PART NO	FILTER 637-2515-()														DESCRIPTION
		001	002	003	004	005	006	007	008	009	010	011	012	013		
FL2	526-9956-010				X	X				X			X			2.75 kHz bandwidth (LSB 250 - 3000 Hz)
FL3	526-9963-060	X	X	X		X	X				X	X				6.0 kHz bandwidth (AM $\pm$ 3000 Hz)
	526-9963-040												X			3.0 kHz bandwidth (AM $\pm$ 1500 Hz)
	526-8322-011													X		0.25 kHz bandwidth (USB 1000 - 1250 Hz)
FL4	526-9963-040	X		X		X	X									3.0 kHz bandwidth (AM $\pm$ 1500 Hz)
	526-9963-030												X			1.0 kHz bandwidth (AM $\pm$ 500 Hz)
	526-8322-020													X		0.7 kHz bandwidth (USB 925 - 1625 Hz)
FL5	526-9963-030	X				X	X			X		X				1.0 kHz bandwidth (AM $\pm$ 500 Hz)
	526-9974-030			X												1.0 kHz bandwidth (USB 500 - 1500 Hz)
	526-9963-020												X			0.5 kHz bandwidth (AM $\pm$ 250 Hz)
	526-8321-020													X		0.7 kHz bandwidth (LSB 925 - 1625 Hz)
FL6	526-9963-020	X				X	X									0.5 kHz bandwidth (AM $\pm$ 250 Hz)
	526-9974-020			X												0.5 kHz bandwidth (USB 750 - 1250 Hz)
	526-9963-090												X			0.3 kHz bandwidth (AM $\pm$ 150 Hz)
	526-8321-010													X		0.25 kHz bandwidth (LSB 1000 - 1250 Hz)
FL7	526-9963-010	X				X				X		X	X			0.2 kHz bandwidth (AM $\pm$ 100 Hz)
	526-9974-010		X	X				X								0.2 kHz bandwidth (USB 900 - 1100 Hz)
	293-1333-010						X									0.1 kHz bandwidth (AM $\pm$ 50 Hz)
	526-9999-010								X							0.37 kHz bandwidth (USB 1515 - 1885 Hz)
	526-8323-010													X		5.0 kHz bandwidth (AM $\pm$ 2500 Hz)
CR11	353-3644-010		X													Anode to E1, cathode to E5

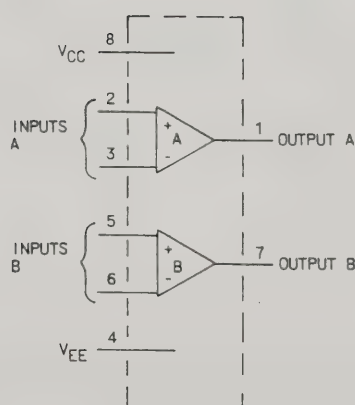
- a. FL2 (LSB), 2.7 kHz, LSB
- b. FL3 (A), 6 kHz, AM
- c. FL4 (B), 3 kHz, AM
- d. FL5 (C), 1 kHz, AM
- e. FL6 (D), 0.5 kHz, AM
- f. FL7 (E), 0.2 kHz, AM

2.4 Dual Operational Amplifier 351-1071-070 (Refer to figure 2.)

The 351-1071-070 consists of two operational amplifiers in one package designed for use as summing amplifiers, integrators, or amplifiers with operating characteristics as a function of the external feedback components.

2.5 Quad Operational Amplifier 351-1141-030 (Refer to figure 3.)

The 351-1141-030 consists of four independent, high-gain, internally frequency-compensated operational amplifiers that are designed to operate from a single power supply over a wide range of voltages. Common applications include transducer amplifiers, dc gain blocks, and all conventional operational amplifier circuits.



CHARACTERISTICS

SUPPLY VOLTAGE: V_{CC} +18 V DC MAX

V_{EE} -18 V DC MAX

INPUT DIFF VOLTAGE: ± 30 V MAX

INPUT COMMON MODE VOLTAGE:

± 15 V MAX (1)

OUTPUT SHORT CIRCUIT DURATION:

CONTINUOUS (2)

INPUT RESISTANCE: 300 k Ω MIN, 2.0 M Ω MAX

OUTPUT RESISTANCE: 75 Ω TYPICAL

VOLTAGE GAIN: 15 MIN

NOTES:

(1) FOR SUPPLY VOLTAGE LESS THAN ± 15.0 V, MAX INPUT VOLTAGE EQUAL TO SUPPLY VOLTAGE.

(2) SUPPLY VOLTAGE EQUAL TO OR LESS THAN 15 V.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the filter card are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 2 check total performance of the filter card. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

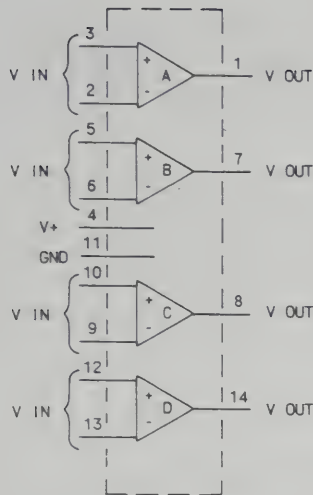
4. ALIGNMENT/ADJUSTMENT

4.1 Filter Amplifier Gain Adjustment

- a. Set front-panel MODE switch to AM and BANDWIDTH switch to 16. Set AGC switch to FAST.
- b. Measure signal at channel A if J1 with no receive input signal.

TP5-2285-013

Dual Operational Amplifier 351-1071-070
Figure 2



CHARACTERISTICS

SUPPLY VOLTAGE (V+): 32 V DC MAX
 INPUT DIFF VOLTAGE: 32 V DC MAX
 INPUT COMMON MODE VOLTAGE: V+ (-1.5 V DC)
 OUTPUT SHORT CIRCUIT DURATION:
 CONTINUOUS (1)
 VOLTAGE GAIN: 25 MIN

NOTE:

(1) SUPPLY VOLTAGE EQUAL TO OR LESS THAN 15 V.

TP5-2289-013

Quad Operational Amplifier 351-1141-030
 Figure 3

4.1.1 AM Filters

- Connect receive input of 9.4500 MHz to channel A if.
- Set receive signal to 50 μ V (9.4500 MHz). Find a passband response minimum between 9.4493 and 9.4489 MHz at channel A if J4. Measure voltage gain between channel A if J1 and J4; should be 8.2 ± 2.0 dB.
- Set front-panel BANDWIDTH switch to position associated with filter being gain adjusted (refer to table 3).
- Find a passband response minimum between 9.4493 and 9.4489 MHz at channel A if J4. Measure voltage gain between channel A if J1 and J4; should be 8.2 ± 2.0 dB. Select value of gain adjust resistor shown in table 3. (200 through 750 Ω) to give a voltage gain of 8.2 ± 2.0 dB.

4.1.2 LSB Filter

- Connect receive input of 9.4517 MHz to channel A if.
- Set receive signal to 50 μ V (9.4517 MHz). Find a passband response minimum between 9.4507 and 9.4511 MHz at channel A if J4. Measure voltage

gain between channel A if J1 and J4. Should be 8.2 ± 2.0 dB.

- Set front-panel BANDWIDTH switch to position associated with filter being gain adjusted (refer to table 3).
- Find a passband response minimum between 9.4507 and 9.4511 MHz at channel A if J4. Measure voltage gain between channel A if J1 and J4. Should be 8.2 ± 2.0 dB. Select value of gain adjust resistor shown in table 3 (200 through 750 Ω) to give a voltage gain of 8.2 ± 2.0 dB.

4.1.3 USB Filters

- Connect receive input of 9.4490 MHz to channel A if.
- Set receive signal to 50 μ V (9.4490 MHz). Find a passband response minimum between 9.44 and 9.44 MHz at channel A if J4. Should be 8.2 ± 2.0 dB. Note this level for reference.
- Set front panel BANDWIDTH switch to position associated with filter being adjusted (refer to table 3).
- Find a passband response minimum between 944 and 9.44 MHz at channel A if J4. Measure voltage gain between channel A if J1 and J4. This should

Table 2. Filter, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit containing the control that is to be tested. b. Remove channel A if (with filter installed). c. Remove filter from channel A if. d. Test channel A if. e. When channel A if operation is verified mount filter on channel A if. Install channel A if with filter on an extender card and place it in the unit. f. Set unit LINE SELECTOR switch to 115 V. g. Connect unit to 115-V ac power source and set power on. h. Measure dc voltages between the following pins and ground (P8-6, 7; P9-5, 6; or P10-2, 5): P9-4 P9-2	+15 $\pm$1.0 V dc. -10 $\pm$1.0 V dc.	Check associated power supply.
2. 2.75-kHz LSB filter measurement	Note This test applies only to 2.75-kHz LSB filter (526-9956-010). a. Set front-panel MODE switch to SSB/CW and BANDWIDTH switch to LSB. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4517 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.450250 MHz. NLT 9.453000 MHz.	Check FL2, Q9, Q10, and associated circuit. Check FL2, Q9, Q10, and associated circuit.

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. 6-kHz AM filter measurement	Note This test applies only to 6-kHz AM filter (526-9963-060). a. Set front-panel MODE switch to SSB/CW and BANDWIDTH switch to A. Note If 6-kHz filter is in any filter slot other than A, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4500 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.447000 MHz. NLT 9.453000 MHz	Check FL3, Q11, Q12, and associated circuit. Check FL3, Q11, Q12, and associated circuit.
4. 3-kHz AM filter measurement	Note This test applies only to 3-kHz AM filter (526-9963-040). a. Set front-panel MODE switch to SSB/CW and BANDWIDTH switch to B. Note If 3-kHz filter is in any filter slot other than B, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4500 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4.	Reference.	
(Cont)			

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. (Cont)	e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	NMT 9.448500 MHz. NLT 9.451500 MHz.	Check FL4, Q1, Q2, and associated circuit. Check FL4, Q1, Q2, and associated circuit.
5. 1.0-kHz AM filter measurement	Note This test applies only to 1.0-kHz AM filter (526-9963-030). a. Set front-panel MODE switch to SSB/CW and BANDWIDTH switch to C. Note If 1.0-kHz filter is in any filter slot other than C, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4500 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.449500 MHz. NLT 9.450500 MHz.	Check FL4, Q3, Q4, and associated circuit. Check FL5, Q3, Q4, and associated circuit.
5A. 1.0-kHz USB filter measurement	Note This test applies only to 1.0-kHz USB filter (526-9974-030). a. Set front-panel MODE switch to SSB/CW and BANDWIDTH switch to C. Note If 1.0-kHz filter is in any filter slot other than C, set BANDWIDTH switch to that position. b. Set AGC switch to OFF.		
(Cont)			

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5A. (Cont)	c. Set receive input at channel A if J2 for 9.4490 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.448500 MHz. NLT 9.449500 MHz.	Check FL4, Q3, Q4, and associated circuit. Check FL5, Q3, Q4, and associated circuit.
6. 0.5-kHz AM filter measurement	Note This test applies only to 0.5-kHz AM filter (526-9963-020). a. Set front-panel MODE switch to SSB/CW and BANDWIDTH switch to D. Note If 0.5-kHz filter is in any filter slot other than D, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4500 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.449750 MHz. NLT 9.450250 MHz.	Check FL6, Q5, Q6, and associated circuit. Check FL6, Q5, Q6, and associated circuit.
6A. 0.5-kHz USB filter measurement (Cont)	Note This test applies only to 0.5-kHz USB filter (526-9974-020). a. Set front-panel MODE switch to SSB/CW and BANDWIDTH switch to D.		

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6A. (Cont)	Note If 0.5-kHz filter is in any filter slot other than D, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4490 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.448750 MHz. NLT 9.449250 MHz.	Check FL6, Q5, Q6, and associated circuit. Check FL6, Q5, Q6, and associated circuit.
7. 0.2-kHz AM filter measurement	Note This test applies only to 0.2-kHz AM filter (526-9963-010). a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to E. Note If 0.2-kHz filter is in any filter slot other than E, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4500 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.449900 MHz. NLT 9.450100 MHz.	Check FL7, Q7, Q8, and associated circuit. Check FL7, Q7, Q8, and associated circuit.

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7A. 0.2-kHz USB filter measurement	Note This test applies only to 0.2-kHz USB filter (526-9974-010). a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to E. Note If 0.2-kHz filter is in any filter slot other than E, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4490 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference NMT 9.448900 MHz. NLT 9.449100 MHz.	Check FL7, Q7, Q8, and associated circuit. Check FL7, Q7, Q8, and associated circuit.
8. 0.1-kHz AM filter measurement	Note This test applies only to 0.1-kHz AM filter (293-1333-010). a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to E. Note If 0.1-kHz filter is in any filter slot other than E, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4500 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.449950 MHz.	Check FL7, Q7, Q8, and associated circuit.

(Cont)

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	NLT 9.450050 MHz.	Check FL7, Q7, Q8, and associated circuit.
9. 0.37-kHz USB filter measurement	Note This test applies only to 0.37-kHz USB filter (526-9999-010). a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to E. Note If 0.37-kHz filter is in any filter slot other than E, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4483 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.448115 MHz. NLT 9.448485 MHz.	Check FL7, Q7, Q8, and associated circuit. Check FL7, Q7, Q8, and associated circuit.
10. 5.0-kHz AM filter measurement	Note This test applies only to 5.0-kHz AM filter (526-8323-010). a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to E. Note If 5.0-kHz filter is in any filter slot other than E, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4500 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4.	Reference	

(Cont)

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10. (Cont)	e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	NMT 9.447500 MHz. NLT 9.452500 MHz.	Check FL7, Q7, Q8, and associated circuit. Check FL7, Q7, Q8, and associated circuit.
11. 0.25-kHz USB filter measurement	Note This test applies only to 0.25-kHz USB filter 526-8322-010. a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to A. Note If 0.25-kHz filter is in any filter slot other than A, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4489 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.448750 MHz. NLT 9.449000 MHz.	Check FL7, Q7, Q8, and associated circuit. Check FL7, Q7, Q8, and associated circuit.
11A. 0.25-kHz LSB filter measurement	Note This test applies only to 0.25-kHz LSB filter 526-8321-010. a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to D. Note If 0.25-kHz filter is in any filter slot other than D, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4511 MHz.		
(Cont)			

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11A. (Cont)	d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.451000 MHz. NLT 9.451250 MHz.	Check FL7, Q7, Q8, and associated circuit. Check FL7, Q7, Q8, and associated circuit.
12. 0.7-kHz USB filter measurement	Note This test applies only to 0.7-kHz USB filter 526-8322-020. a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to B. Note If 0.7-kHz filter is in any filter slot other than B, set BANDWIDTH switch to that position. b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4487 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.448375 MHz. NLT 9.449075 MHz.	Check FL7, Q7, Q8, and associated circuit. Check FL7, Q7, Q8, and associated circuit.
12A. 0.7-kHz LSB filter measurement	Note This test applies only to 0.7-kHz LSB filter 526-8321-020. a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to D. Note If 0.7-kHz filter is in any filter slot other than D set BANDWIDTH switch to that position.		
(Cont)			

Table 2. Filter, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
12A. (Cont)	b. Set AGC switch to OFF. c. Set receive input at channel A if J2 for 9.4513 MHz. d. Using an rf voltmeter, measure rf voltage at channel A if J4. Adjust receive input level and frequency for a 70-mV peak reading at channel A if J4. e. Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency. f. Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note input frequency.	Reference. NMT 9.450925 MHz. NLT 9.451625 MHz.	Check FL7, Q7, Q8, and associated circuit. Check FL7, Q7, Q8, and associated circuit.

Table 3. Filter Amplifier Gain/Passband Component Selection.

BANDWIDTH SWITCH POSITION	FILTER	GAIN ADJUST	PASSBAND TRIM CAPACITORS
LSB	FL2	R31	C31, C34, C58, C64
A	FL3	R38	C38, C41, C59, C65
B	FL4	R3	C3, C6, C54, C60
C	FL5	R10	C10, C13, C55, C61
D	FL6	R17	C17, C20, C56, C62
E	FL7	R24	C24, C27, C57, C63

be 8.2 ± 2.0 dB. Select value of gain adjust resistor shown in table 3 (330 thru 1500 Ω) to give a voltage gain equal to 8.2 ± 2.0 dB.

4.2 Filter Passband Measurement

- Set front-panel MODE switch to SSB/CW and BANDWIDTH switch to position associated with filter having its passband measured (refer to table 3).
- Set AGC switch to OFF.
- Set receive input at channel A if J2 for receive if input frequency shown in table 4.
- Using an rf voltmeter, measure voltage at channel A if J4. Adjust receive input level and frequency

for a 70-mV peak reading at channel A if J4. Note this level for reference.

- Adjust input frequency down until rf voltage at channel A if J4 is 3 dB below level of step d. Note the input frequency. If more than the lower 3 dB frequency of the applicable filter in table 4, select value of associated passband adjust capacitors (refer to table 3) until the lower 3-dB frequency is not more than that listed in table 4.
- Adjust input frequency up until rf voltage at channel A if J4 is 3 dB below level of step d. Note the input frequency. If less than the upper 3 dB frequency of the applicable filter in table 4, select value of associated passband adjust capacitors (refer to table 3) until the upper 3-dB frequency is not less than that listed in table 4.

Table 4. Filter Passband Frequencies.

FILTER PASSBAND	RECEIVE IF INPUT	LOWER 3 dB (NMT)	UPPER 3 dB (NLT)
LSB 2.75 kHz	9.4517 MHz	9.450250 MHz	9.453000 MHz
AM 6 kHz	9.4500 MHz	9.447000 MHz	9.453000 MHz
AM 3 kHz	9.4500 MHz	9.448500 MHz	9.451500 MHz
AM 1 kHz	9.4500 MHz	9.449500 MHz	9.450500 MHz
USB 1 kHz	9.4490 MHz	9.448500 MHz	9.449500 MHz
AM 0.5 kHz	9.4500 MHz	9.449750 MHz	9.450250 MHz
USB 0.5 kHz	9.4490 MHz	9.448750 MHz	9.449250 MHz
AM 0.2 kHz	9.4500 MHz	9.449900 MHz	9.450100 MHz
USB 0.2 kHz	9.4490 MHz	9.448900 MHz	9.449100 MHz
AM 0.1 kHz	9.4500 MHz	9.449950 MHz	9.450050 MHz
USB 0.37 kHz	9.4483 MHz	9.448115 MHz	9.448485 MHz
AM 5 kHz	9.4500 MHz	9.447500 MHz	9.452500 MHz
USB 0.25 kHz	9.4489 MHz	9.448750 MHz	9.449000 MHz
LSB 0.25 kHz	9.4511 MHz	9.451000 MHz	9.451250 MHz
USB 0.7 kHz	9.4487 MHz	9.448375 MHz	9.449075 MHz
LSB 0.7 kHz	9.4513 MHz	9.450925 MHz	9.451625 MHz

4.3 CW Mode Strapping

Input to enable CW mode filter is strapped as required for special applications. If FL8 (16-kHz passband) is to be used, CW mode diode strapping is not required. Refer to table 5 for strap-filter selection for CW mode.

Table 5. CW Mode Strapping.

INPUT	ANODE STRAP	DIODE	CATHODE STRAP	FILTER SELECTED
P8-1	E1	CR11	E2 E3 E4 E5	FL4 FL5 FL6 FL7

5. REPAIR

Repair of the filter card is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special

handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in the identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figures 4 and 5). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applied to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

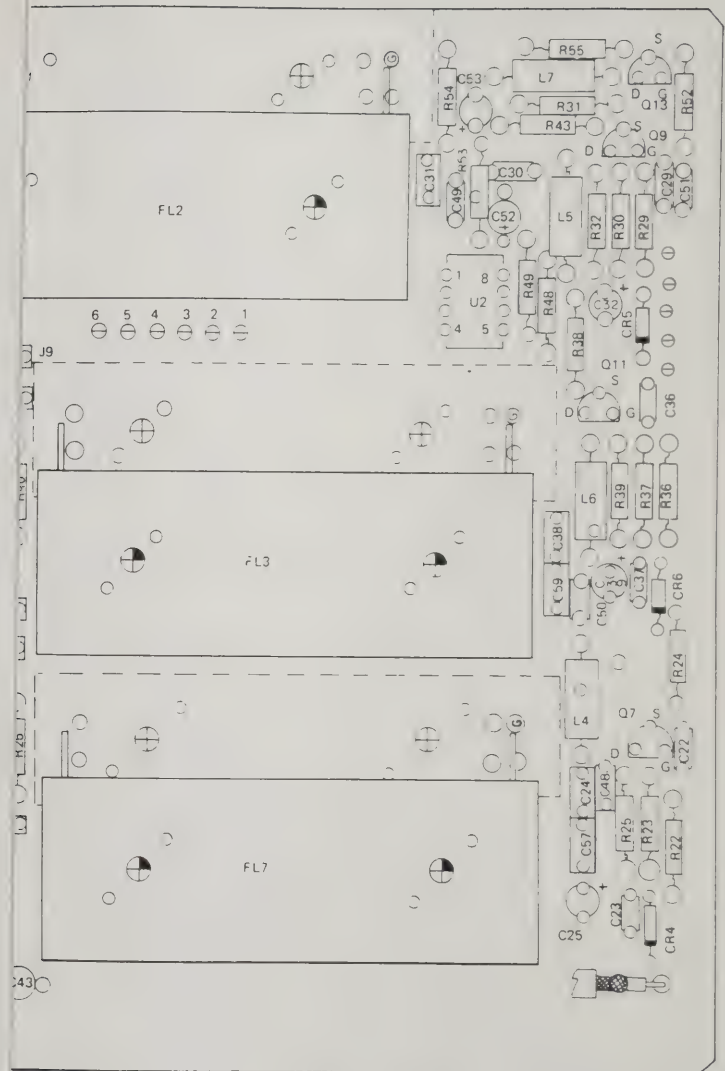
<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
12040	NATIONAL SEMICONDUCTOR CORP COMMERCE DR P O BOX 443 DANBURY CT 06810
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV PO BOX 728 855 35TH STREET NE CEDAR RAPIDS IA 52406
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
81349	MILITARY SPECIFICATION
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
96906	MILITARY STANDARD

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Filter	637-2515-001	REV L
Filter	637-2515-002	REV L
Filter	637-2515-003	REV L
Filter	637-2515-004	REV J
Filter	637-2515-005	REV L
Filter	637-2515-006	REV L
Filter	637-2515-007	REV J
Filter	637-2515-008	REV L
Filter	637-2515-009	REV J
Filter	637-2515-010	REV J
Filter	637-2515-011	REV K
Filter	637-2515-012	REV L
Filter	637-2515-013	REV —
Filter board	635-0905-001	REV —
Filter board	635-0905-002	REV —
Resistor, test select	638-1468-001	REV A



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Filter, Schematic Diagram
Figure 4 (Sheet 1 of 4)

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the **DESCRIPTION** column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the **EFFECTIVITY** column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applied to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

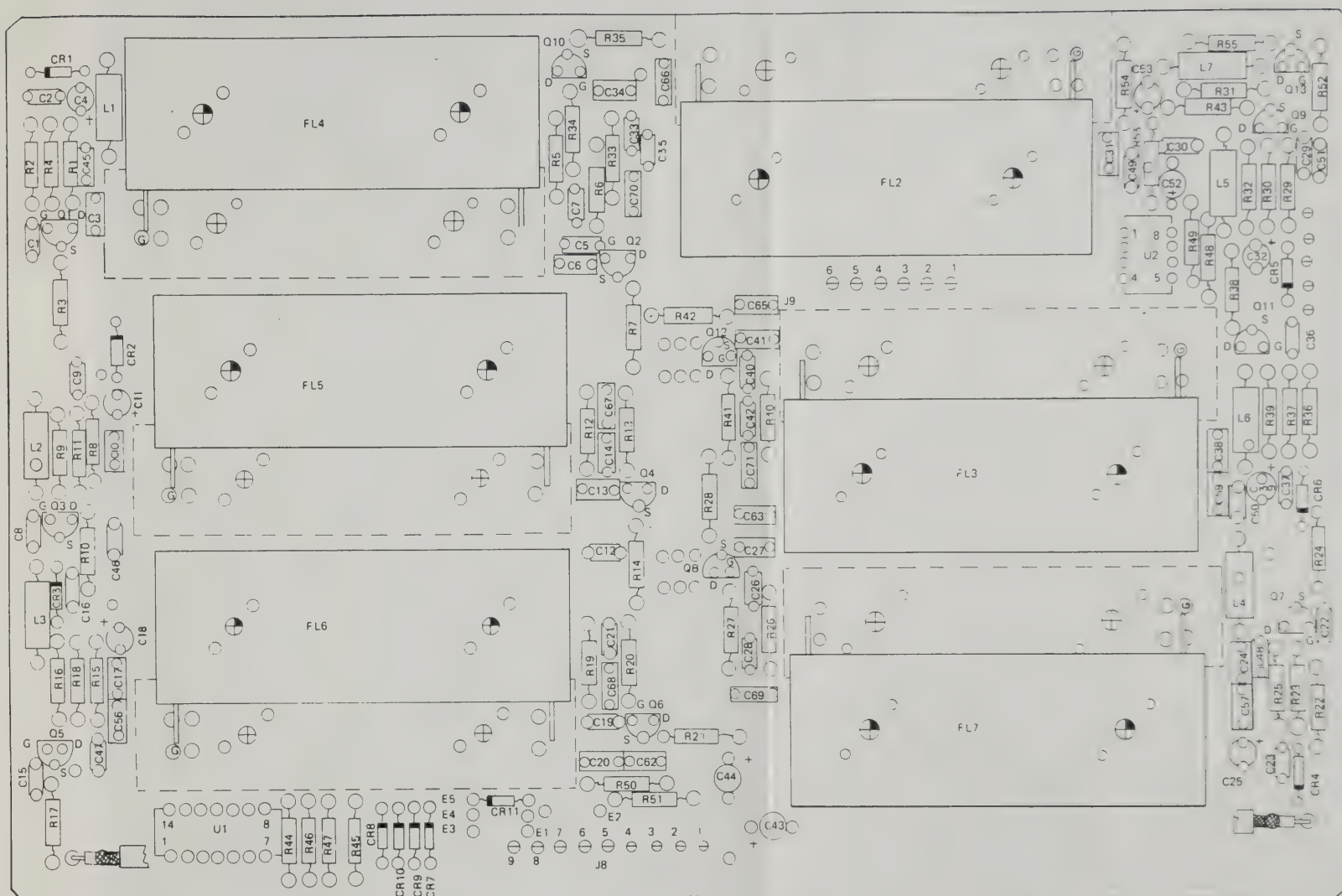
<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
12040	NATIONAL SEMICONDUCTOR CORP COMMERCE DR P O BOX 443 DANBURY CT 06810
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV PO BOX 728 855 35TH STREET NE CEDAR RAPIDS IA 52406
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
81349	MILITARY SPECIFICATION
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
96906	MILITARY STANDARD

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Filter	637-2515-001	REV L
Filter	637-2515-002	REV L
Filter	637-2515-003	REV L
Filter	637-2515-004	REV J
Filter	637-2515-005	REV L
Filter	637-2515-006	REV L
Filter	637-2515-007	REV J
Filter	637-2515-008	REV L
Filter	637-2515-009	REV J
Filter	637-2515-010	REV J
Filter	637-2515-011	REV K
Filter	637-2515-012	REV L
Filter	637-2515-013	REV —
Filter board	635-0905-001	REV —
Filter board	635-0905-002	REV —
Resistor, test select	638-1468-001	REV A



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Filter, Schematic Diagram
Figure 4 (Sheet 1 of 4)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	S	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	FILTER	637-2515-001 A						
	FILTER	637-2515-002 B						
	FILTER	637-2515-003 C						
	FILTER	637-2515-005 D						
	FILTER	637-2515-006 E						
	FILTER	637-2515-008 F						
	FILTER	637-2515-009 G						
	FILTER	637-2515-010 H						
	FILTER	637-2515-011 J						
	FILTER	637-2515-012 K						
	FILTER	637-2515-013 L						
CR1-CR10	NOT USED							
CR11	SEMICONDUCTOR DEVICE	353-3644-010 B		03508	02-220		56269	1990225X0025BB1
C1,C2	NOT USED				19-200		81349	CK058X103K
C3	CAPACITOR,FXD MICA DIE, 360PF, 5%, 50V	912-4141-500 A,C,D,E		93790				
C3	CAPACITOR,FXD MICA DIE, 110PF, 5%, 50V	912-4141-370 K		93790	19-200		81349	CK058X103K
C3	CAPACITOR,FXD MICA DIE, 100PF, 5%, 50V	912-4141-050 L		93790	18-000		81349	CK058X102K
C4,C5	NOT USED				19-200		81349	CK058X103K
C6	CAPACITOR,FXD MICA DIE, 360PF, 5%, 50V	912-4141-500 A,C,D,E		93790				
C6	CAPACITOR,FXD MICA DIE, 110PF, 5%, 50V	912-4141-370 K		93790	02-220		56269	1990225X0025BB1
C6	CAPACITOR,FXD MICA DIE, 100PF, 5%, 50V	912-4141-050 L		93790	19-200		81349	CK058X103K
C7-C9	NOT USED							
C10	CAPACITOR,FXD MICA DIE, 110PF, 5%, 50V	912-4141-370 A,C,D,E		93790	19-200		81349	CK058X103K
		G,J			02-800		56269	1990155X0035BE3
C10	CAPACITOR,FXD MICA DIE, 270PF, 5%, 50V	912-4141-470 K		93790	19-200		81349	CK058X103K
C10	CAPACITOR,FXD MICA DIE, 100PF, 5%, 50V	912-4141-050 L		93790	02-800		56269	1990155X0035BE3
C11,C12	NOT USED				02-220		56269	1990225X0025BB1
C13	CAPACITOR,FXD MICA DIE, 110PF, 5%, 50V	912-4141-370 A,C,D,E		93790				
		G,J			19-440		81349	CK068X104K
C13	CAPACITOR,FXD MICA DIE, 270PF, 5%, 50V	912-4141-470 K		93790	67-001		637-3767-001	
C13	CAPACITOR,FXD MICA DIE, 100PF, 5%, 50V	912-4141-050 L		93790	15-580		96906	MS75089-32
C14-C16	NOT USED				15-460		96906	MS75089-20
C17	CAPACITOR,FXD MICA DIE, 270PF, 5%, 50V	912-4141-470 A,D,E		93790	68-010		04713	SPF557
C17	CAPACITOR,FXD MICA DIE, 100PF, 5%, 50V	912-4141-050 C,K		93790	85-000		81349	RCR07G103KS
C17	CAPACITOR,FXD MICA DIE, 51PF, 5%, 50V	912-4141-300 L		93790	21-000		81349	RCR07G104KS
C18,C19	NOT USED				79-000		81349	RN5504420F
C20	CAPACITOR,FXD MICA DIE, 270PF, 5%, 50V	912-4141-470 A,D,E		93790	30-000		81349	RN5505111F
C20	CAPACITOR,FXD MICA DIE, 100PF, 5%, 50V	912-4141-050 C,K		93790	85-000		81349	RCR07G103KS
C20	CAPACITOR,FXD MICA DIE, 51PF, 5%, 50V	912-4141-300 L		93790	20-000		81349	RN5505111F
C21-C23	NOT USED							
C24	CAPACITOR,FXD MICA DIE, 180PF, 5%, 50V	912-4141-430 A,B,C,D		93790	85-000		81349	RCR07G103KS
		G,J,K			21-000		81349	RCR07G104KS
C24	CAPACITOR,FXD MICA DIE, 180PF, 5%, 50V (A2)	912-4141-430 F		93790	79-000		81349	RN5504420F
C24	CAPACITOR,FXD MICA DIE, 220PF, 5%, 50V	912-4141-450 F		93790	30-000		81349	RN5505111F
C24	CAPACITOR,FXD MICA DIE, 360PF, 5%, 50V	912-4141-500 L		93790	85-000		81349	RCR07G103KS
C25,C26	NOT USED				30-000		81349	RN5505111F
C27	CAPACITOR,FXD MICA DIE, 180PF, 5%, 50V	912-4141-430 A,B,C,D		93790				
		G,J,K			85-000		81349	RCR07G103KS
C27	CAPACITOR,FXD MICA DIE, 180PF, 5%, 50V (A2)	912-4141-430 F		93790	21-000		81349	RCR07G104KS
C27	CAPACITOR,FXD MICA DIE, 220PF, 5%, 50V	912-4141-450 F		93790	79-000		81349	RN5504420F
C27	CAPACITOR,FXD MICA DIE, 360PF, 5%, 50V	912-4141-500 L		93790	30-000		81349	RN5505111F
C28-C30	NOT USED				35-000		81349	RCR07G103KS
C31	CAPACITOR,FXD MICA DIE, 22PF, PORM 0.5PF, 300V	912-4141-030 D,G,K		93790	30-000		81349	RN5505111F
C32,C33	NOT USED				85-000		81349	RCR07G103KS
C34	CAPACITOR,FXD MICA DIE, 22PF, PORM 0.5PF, 300V	912-4141-030 D,G,K		93790	21-000		81349	RCR07G104KS
					79-000		81349	RN5504420F
C35-C37	NOT USED				30-000		81349	RN5505111F
C38	CAPACITOR,FXD MICA DIE, 360PF, 5%, 50V	912-4141-500 A,B,C,D		93790	85-000		81349	RCR07G103KS
		E,H,J,K			30-000		81349	RN5505111F
C38	CAPACITOR,FXD MICA DIE, 51PF, 5%, 50V	912-4141-300 L		93790				
C39,C40	NOT USED				85-000		81349	RCR07G103KS
C41	CAPACITOR,FXD MICA DIE, 390PF, 5%, 50V	912-4141-510 A,B,C,D		72136	21-000		81349	RCR07G104KS
		E,H,J			79-000		81349	RN5504420F
C41	CAPACITOR,FXD MICA DIE, 360PF, 5%, 50V	912-4141-500 K		93790	30-000		81349	RN5505111F
C41	CAPACITOR,FXD MICA DIE, 51PF, 5%, 50V	912-4141-300 L		93790	85-000		81349	RCR07G103KS
C42-C55	NOT USED				30-000		81349	RN5505111F
C56	CAPACITOR,FXD MICA DIE, 150PF, 5%, 50V	912-4141-400 C		93790				
C56	CAPACITOR,FXD MICA DIE, 100PF, 5%, 50V	912-4141-050 K		93790	85-000		81349	RCR07G103KS
C57	CAPACITOR,FXD MICA DIE, 110PF, 5%, 50V	912-4141-370 L		93790	21-000		81349	RCR07G104KS
C58	NOT USED				79-000		81349	RN5504420F
C59	CAPACITOR,FXD MICA DIE, 390PF, 5%, 50V	912-4141-510 A,B,C,D		72136	80-000		81349	RN5505111F
		E,J			85-000		81349	RCR07G103KS
C59	CAPACITOR,FXD MICA DIE, 360PF, 5%, 50V	912-4141-500 H		93790	80-000		81349	RN5505111F
C60,C61	NOT USED							
C62	CAPACITOR,FXD MICA DIE, 150PF, 5%, 50V	912-4141-400 C		93790	25-000		81349	RCR07G221KS
C62	CAPACITOR,FXD MICA DIE, 100PF, 5%, 50V	912-4141-050 K		93790	67-000		81349	RCR07G105KS
C63	CAPACITOR,FXD MICA DIE, 110PF, 5%, 50V	912-4141-370 L		93790	20-000		81349	RCR07G392KS
C64	NOT USED				97-000		81349	RCR07G223KS
C65	CAPACITOR,FXD MICA DIE, 360PF, 5%, 50V	912-4141-500 A,B,C,D		93790	21-000		81349	RCR07G104KS
		E,J			37-000		81349	RCR07G471KS
C65	CAPACITOR,FXD MICA DIE, 390PF, 5%, 50V	912-4141-510 H		72136	84-000		81349	RCR07G560KS
FL1	NOT USED				31-000		81349	RCR07G331KS
FL2	FILTER,BANDPASS, 2.75KHZ, LSB	526-9956-010 D,G,K			1-030		12040	LM324N
FL3	FILTER,BANDPASS, 6KHZ, AM	526-9963-060 A,B,C,D			71-070		07263	UA1458TC
		E,H,J						
FL3	FILTER,BANDPASS, 0.3KHZ, AM	526-9963-090 K						
FL4	FILTER,BANDPASS, 0.25KHZ, USB	526-8322-010 L						
		K						
FL4	FILTER,BANDPASS, 3KHZ, AM	526-9963-040 A,C,D,E						
		K						
FL4	FILTER,BANDPASS, 0.7KHZ, USB	526-8322-020 L						

gram

PARTS LIST

PARTS LIST (Cont)

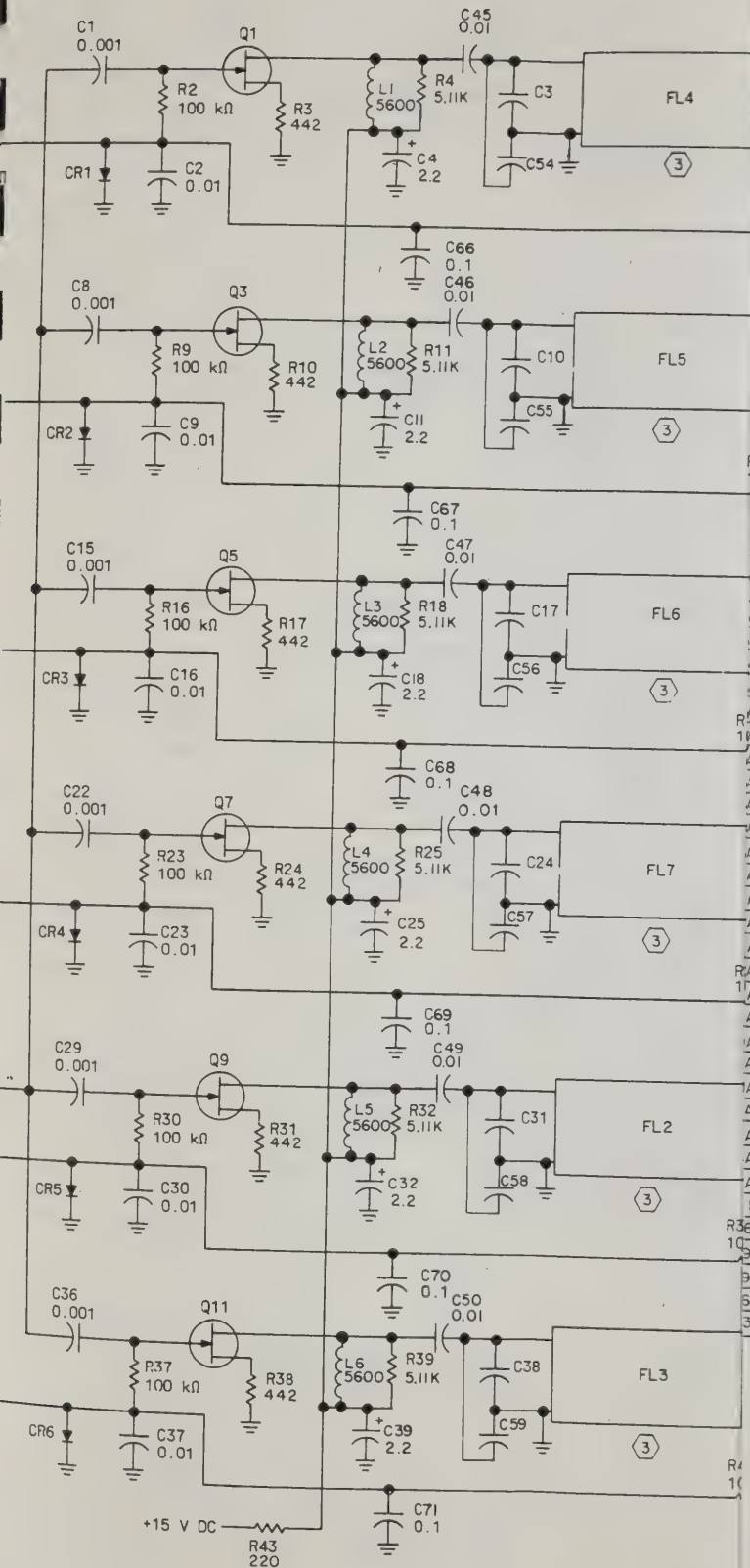
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE IDN CODE	MFR CODE	MFR PART NUMBER
	FILTER	637-2515-001 A			
	FILTER	637-2515-002 B			
	FILTER	637-2515-003 C			
	FILTER	637-2515-005 D			
	FILTER	637-2515-006 E			
	FILTER	637-2515-008 F			
	FILTER	637-2515-009 G			
	FILTER	637-2515-010 H			
	FILTER	637-2515-011 J			
	FILTER	637-2515-012 K			
	FILTER	637-2515-013 L			
CR1-CR10	NOT USED				
CR11	SEMICONO DEVICE	353-3644-010 B		03508	1N4454GE
C1,C2	NOT USED				
C3	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500 A,C,D,E		93790	CD5FY361J0
C3	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370 K		93790	CD5FY111J0
C3	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050 L		93790	CD5FY101J0
C4,C5	NOT USED				
C6	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500 A,C,D,E		93790	CD5FY361J0
C6	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370 K		93790	CD5FY111J0
C6	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050 L		93790	CD5FY101J0
C7-C9	NOT USED				
C10	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370 A,C,D,E		93790	CD5FY111J0
C10	CAPACITOR,FXD MICA DIEL, 270PF, 5%, 50V	912-4141-470 K		93790	CD5FY271J0
C10	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050 L		93790	CD5FY101J0
C11,C12	NOT USED				
C13	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370 A,C,D,E		93790	CD5FY111J0
C13	CAPACITOR,FXD MICA DIEL, 270PF, 5%, 50V	912-4141-470 K		93790	CD5FY271J0
C13	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050 L		93790	CD5FY101J0
C14-C16	NOT USED				
C17	CAPACITOR,FXD MICA DIEL, 270PF, 5%, 50V	912-4141-470 A,D,E		93790	CD5FY271J0
C17	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050 C,K		93790	CD5FY101J0
C17	CAPACITOR,FXD MICA DIEL, 51PF, 5%, 50V	912-4141-300 L		93790	CD5EY510J0
C18,C19	NOT USED				
C20	CAPACITOR,FXD MICA DIEL, 270PF, 5%, 50V	912-4141-470 A,D,E		93790	CD5FY271J0
C20	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050 C,K		93790	CD5FY101J0
C20	CAPACITOR,FXD MICA DIEL, 51PF, 5%, 50V	912-4141-300 L		93790	CD5EY510J0
C21-C23	NOT USED				
C24	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430 A,B,C,D		93790	CD5FY181J0
C24	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V (A2)	912-4141-430 F		93790	CD5FY181J0
C24	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 50V	912-4141-450 F		93790	CD5FY221J0
C24	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500 L		93790	CD5FY361J0
C25,C26	NOT USED				
C27	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430 A,B,C,D		93790	CD5FY181J0
C27	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V (A2)	912-4141-430 F		93790	CD5FY181J0
C27	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 50V	912-4141-450 F		93790	CD5FY221J0
C27	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500 L		93790	CD5FY361J0
C28-C30	NOT USED				
C31	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030 D,G,K		93790	CD5EC22000
C32-C33	NOT USED				
C34	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030 D,G,K		93790	CD5EC22000
C35-C37	NOT USED				
C38	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500 A,B,C,D		93790	CD5FY361J0
C38	CAPACITOR,FXD MICA DIEL, 51PF, 5%, 50V	912-4141-300 L		93790	CD5EY510J0
C39,C40	NOT USED				
C41	CAPACITOR,FXD MICA DIEL, 390PF, 5%, 50V	912-4141-510 A,B,C,D		72136	DM5F391J050HV
C41	CAPACITOR,FXD MICA DIEL, 51PF, 5%, 50V	912-4141-300 L		93790	CD5FY361J0
C42-C55	NOT USED				
C56	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400 C		93790	CD5FY151J0
C56	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050 K		93790	CD5FY101J0
C57	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370 L		93790	CD5FY111J0
C58	NOT USED				
C59	CAPACITOR,FXD MICA DIEL, 390PF, 5%, 50V	912-4141-510 A,B,C,D		72136	DM5F391J050HV
C59	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500 H		93790	CD5FY361J0
C60,C61	NOT USED				
C62	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400 C		93790	CD5FY151J0
C62	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050 K		93790	CD5FY101J0
C63	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370 L		93790	CD5FY111J0
C64	NOT USED				
C65	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500 A,B,C,D		93790	CD5FY361J0
C65	CAPACITOR,FXD MICA DIEL, 390PF, 5%, 50V	912-4141-510 H		72136	DM5F391J050HV
FL1	NOT USED				
FL2	FILTER,BANDPASS, 2.75KHZ, LSB	526-9956-010 D,G,K		526-9956-010	
FL3	FILTER,BANDPASS, 6KHZ, AM	526-9963-060 A,B,C,D			
FL3	FILTER,BANDPASS, 0.3KHZ, AM	526-9963-090 K			
FL3	FILTER,BANDPASS, 0.25KHZ, USB	526-8322-010 L			
FL4	FILTER,BANDPASS, 3KHZ, AM	526-9963-040 A,C,D,E			
FL4	FILTER,BANDPASS, 0.7KHZ, USB	526-8322-020 L			

1 USED IF FILTER SECTION DOES NOT MEET SPECIFICATIONS/GAIN

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE IDN CODE	MFR CODE	MFR PART NUMBER
FL5	FILTER,BANDPASS, 1KHZ, AM	526-9963-030 A,D,E,G			
FL5	FILTER,BANDPASS, 1KHZ, USB	526-9974-030 C			
FL5	FILTER,BANDPASS, 0.7KHZ, LSB	526-8321-020 L			
FL6	FILTER,BANDPASS, 0.5KHZ, AM	526-9963-020 A,D,E,K			
FL6	FILTER,BANDPASS, 0.5KHZ, USB	526-9974-020 C			
FL6	FILTER,BANDPASS, 0.25KHZ, LSB	526-8321-010 L			
FL7	FILTER,BANDPASS, 0.2KHZ, AM	526-9963-010 A,D,G,J			
FL7	FILTER,BANDPASS, 0.2KHZ, USB	526-9974-010 B,C			
FL7	FILTER,BANDPASS, 0.1KHZ, AM	293-1333-010 E		00136	2B489
FL7	FILTER,BANDPASS, 0.37KHZ, USB	526-9999-010 F			
FL7	FILTER,BANDPASS, 5KHZ, AM	526-8323-010 L			
R1-R6	NOT USED				
R7	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000 A,C,D,E		81349	RCR07G681JS
R7	RESISTOR,FXD CHPSN, 560 OHMS, 5%, 1/4W	745-0739-000 K		81349	RCR07G561JS
R7	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W	745-0738-000 L		81349	RCR07G511JS
R8-R13	NOT USED				
R14	RESISTOR,FXD CHPSN, 560 OHMS, 5%, 1/4W	745-0739-000 A,C,D,E		81349	RCR07G561JS
R14	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000 K		81349	RCR07G681JS
R14	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W	745-0738-000 L		81349	RCR07G511JS
R15-R20	NOT USED				
R21	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W (A3)	745-0738-000 A,D,E		81349	RCR07G511JS
R21	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000 A,D,E		81349	RCR07G681JS
R21	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W	745-0738-000 C,L		81349	RCR07G511JS
R21	RESISTOR,FXD CHPSN, 430 OHMS, 5%, 1/4W	745-0735-000 K		81349	RCR07G431JS
R22-R27	NOT USED				
R28	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W (A4)	745-0737-000 A,B,C,D		81349	RCR07G471KS
R28	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 1/4W	745-0741-000 A,B,C,D		81349	RCR07G621JS
R28	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W (A5)	745-0737-000 E		81349	RCR07G471KS
R28	RESISTOR,FXD CHPSN, 820 OHMS, 5%, 1/4W	745-0745-000 E		81349	RCR07G821JS
R28	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 1/4W	745-0741-000 J,K		81349	RCR07G621JS
R28	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W	745-0738-000 L		81349	RCR07G511JS
R29-R34	NOT USED				
R35	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W (A6)	745-0737-000 D,G		81349	RCR07G471KS
R35	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000 D,G		81349	RCR07G681JS
R35	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000 K		81349	RCR07G681JS
R36-R41	NOT USED				
R42	RESISTOR,FXD CHPSN, 430 OHMS, 5%, 1/4W	745-0735-000 A,B,C,D		81349	RCR07G431JS
R42	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000 K		81349	RCR07G681JS
R7,R14, R21,R28, R35,R42	RESISTOR, TEST SELECT	638-1468-001			
	RESISTOR,FXD CHPSN, 200 OHMS, 5%, 1/4W	745-0723-000		81349	RCR07G201JS
	RESISTOR,FXD CHPSN, 220 OHMS, 5%, 1/4W	745-0724-000		81349	RCR07G221JS
	RESISTOR,FXD CHPSN, 240 OHMS, 5%, 1/4W	745-0726-000		81349	RCR07G241JS
	RESISTOR,FXD CHPSN, 270 OHMS, 5%, 1/4W	745-0727-000		81349	RCR07G271JS
	RESISTOR,FXD CHPSN, 300 OHMS, 5%, 1/4W	745-0729-000		81349	RCR07G301JS
	RESISTOR,FXD CHPSN, 330 OHMS, 5%, 1/4W	745-0730-000		81349	RCR07G331JS
	RESISTOR,FXD CHPSN, 360 OHMS, 5%, 1/4W	745-0732-000		81349	RCR07G361JS
	RESISTOR,FXD CHPSN, 390 OHMS, 5%, 1/4W	745-0733-000		81349	RCR07G391JS
	RESISTOR,FXD CHPSN, 430 OHMS, 5%, 1/4W	745-0735-000		81349	RCR07G431JS
	RESISTOR,FXD CHPSN, 470 OHMS, 5%, 1/4W	745-0736-000		81349	RCR07G471JS
	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W	745-0738-000		81349	RCR07G511JS
	RESISTOR,FXD CHPSN, 560 OHMS, 5%, 1/4W	745-0739-000		81349	RCR07G561JS
	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 1/4W	745-0741-000		81349	RCR07G621JS
	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000		81349	RCR07G681JS
	RESISTOR,FXD CHPSN, 750 OHMS, 5%, 1/4W	745-0744-000		81349	RCR07G751JS
	RESISTOR,FXD CHPSN, 820 OHMS, 5%, 1/4W (A1)	745-0745-000		81349	RCR07G821JS
	RESISTOR,FXD CHPSN, 910 OHMS, 5%, 1/4W (A1)	745-0747-000		81349	RCR07G911JS
	RESISTOR,FXD CHPSN, 1K, 5%, 1/4W (A1)	745-0748-000		81349	RCR07G102JS
R42	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W	745-0738-000 L		81349	RCR07G511JS
CR1-CR10	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
C1	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C2	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C3	NOT USED				
C4	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	199D225X0025BB1
C5	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C6	NOT USED				
C7	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C8	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C9	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C10	NOT USED				
C11	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	199D225X0025BB1
C12	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C13	NOT USED				
C14	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C15	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C16	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C17	NOT USED				
C18	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	199D225X0025BB1
C19	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C20	NOT USED				

REF DES	DESCRIPTION	PART NUMBER	COLLINS PART NUMBER	USABLE IDN CODE	MFR CODE	MFR PART NUMBER
C21	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C22	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V		913-4018-000		81349	CK05BX102K
C23	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C24	NOT USED					
C25	CAPACITOR,FXD TMTLM ELCLT, 2.2UF, 20%, 25V		184-9102-220		56289	1990225X0025B
C26	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C27	NOT USED					
C28	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C29	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V		913-4018-000		81349	CK05BX102K
C30	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C31	NOT USED					
C32	CAPACITOR,FXD TMTLM ELCLT, 2.2UF, 20%, 25V		184-9102-220		56289	1990225X0025B
C33	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C34	NOT USED					
C35	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C36	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V		913-4018-000		81349	CK05BX102K
C37	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C38	NOT USED					
C39	CAPACITOR,FXD TMTLM ELCLT, 2.2UF, 20%, 25V		184-9102-220		56289	1990225X0025B
C40	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C41	NOT USED					
C42	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C43,C44	CAPACITOR,FXD TMTLM ELCLT, 1.5UF, 20%, 35V		184-9102-800		56289	1990155X0035B
C45-C51	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V		913-5019-200		81349	CK05BX103K
C52	CAPACITOR,FXD TMTLM ELCLT, 1.5UF, 20%, 35V		184-9102-800		56289	1990155X0035B
C53	CAPACITOR,FXD TMTLM ELCLT, 2.2UF, 20%, 25V		184-9102-220		56289	1990225X0025B
C54-C65	NOT USED					
C66-C71	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V		913-5019-440		81349	CK06BX104K
L1-L3	INDUCTOR, SHIELDED, 5600UH		637-3767-001		637-3767-001	
L4-L6	COIL,RF 5600UH		240-2715-580		96906	MS75089-32
L7	COIL,RF 560UH		240-2715-460		96906	MS75089-20
Q1-Q13	TRANSISTOR (ESDS)		352-1068-010		04713	SPF557
R1	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R2	RESISTOR,FXD CHPSN, 0.10MEG, 10%, 1/4W		745-0821-000		81349	RCR07G104KS
R3	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W		705-0979-000		81349	RN5504420F
R4	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R5	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R6	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R7	NOT USED					
R8	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R9	RESISTOR,FXD CHPSN, 0.10MEG, 10%, 1/4W		745-0821-000		81349	RCR07G104KS
R10	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W		705-0979-000		81349	RN5504420F
R11	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R12	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R13	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R14	NOT USED					
R15	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R16	RESISTOR,FXD CHPSN, 0.10MEG, 10%, 1/4W		745-0821-000		81349	RCR07G104KS
R17	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W		705-0979-000		81349	RN5504420F
R18	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R19	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R20	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R21	NOT USED					
R22	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R23	RESISTOR,FXD CHPSN, 0.10MEG, 10%, 1/4W		745-0821-000		81349	RCR07G104KS
R24	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W		705-0979-000		81349	RN5504420F
R25	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R26	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R27	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R28	NOT USED					
R29	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R30	RESISTOR,FXD CHPSN, 0.10MEG, 10%, 1/4W		745-0821-000		81349	RCR07G104KS
R31	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W		705-0979-000		81349	RN5504420F
R32	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R33	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R34	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R35	NOT USED					
R36	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R37	RESISTOR,FXD CHPSN, 0.10MEG, 10%, 1/4W		745-0821-000		81349	RCR07G104KS
R38	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W		705-0979-000		81349	RN5504420F
R39	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R40	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W		745-0765-000		81349	RCR07G103KS
R41	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W		705-1030-000		81349	RN5505111F
R42	NOT USED					
R43	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W		745-0765-000		81349	RCR07G221KS
R44-R49	RESISTOR,FXD CHPSN, 1MEG, 10%, 1/4W		745-0857-000		81349	RCR07G105KS
R50	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/4W		745-0770-000		81349	RCR07G7592KS
R51	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W		745-0797-000		81349	RCR07G223KS
R52	RESISTOR,FXD CHPSN, 0.10MEG, 10%, 1/4W		745-0821-000		81349	RCR07G104KS
R53	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W		745-0737-000		81349	RCR07G471KS
R54	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/4W		745-0704-000		81349	RCR07G560KS
R55	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W		745-0731-000		81349	RCR07G331KS
U1	AMPLIFIER,QUAD		351-1141-030		12040	LM324N
U2	INTEGRATED CIRCUIT OPNL AMPLIFIER		351-1071-070		07263	UA1458TC



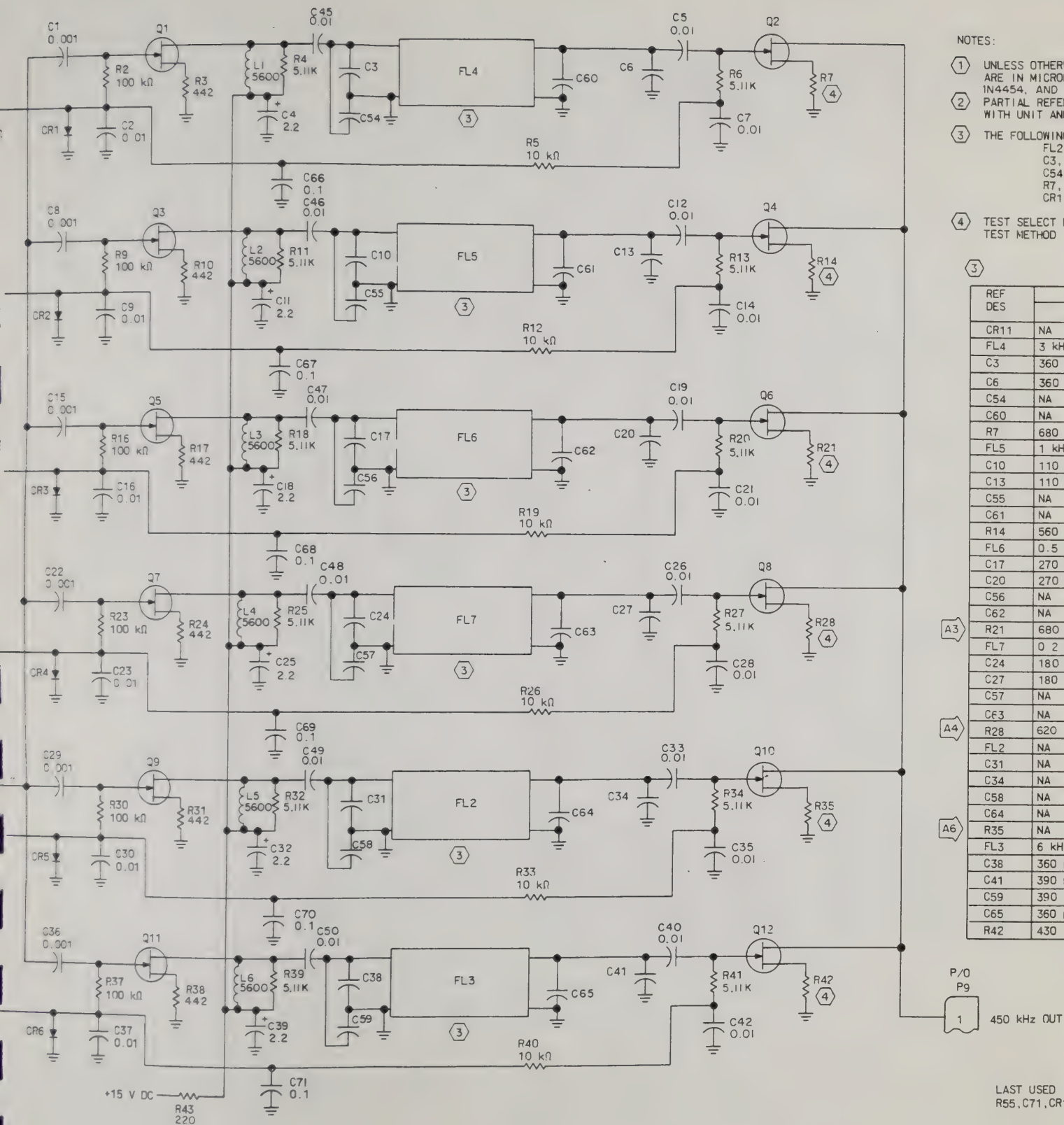
CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES.
G METHODS AND MATERIALS MUST BE USED TO PREVENT
GE.

NS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE
CABLE PARTS LIST FOR REPLACEMENT PARTS.

	-010	-011	-012	-013
A	NA	NA	NA	NA
A	NA	1 kHz AM	0.7 kHz USB	
A	NA	110 pF		
A	NA	110 pF		
A	NA	NA		
A	NA	NA		
A	NA	560	510	
A	1 kHz AM	0.5 kHz AM	0.7 kHz LSB	
A	110 pF	270 pF		
A	110 pF	270 pF		
A	NA	NA		
A	NA	NA		
A	560	680	510	
A	NA	0.3 kHz AM	0.25 kHz LSB	
A	NA	100 pF		
A	NA	100 pF		
A	NA	100 pF		
A	NA	430	510	
A	0.2 kHz AM	0.2 kHz AM	5 kHz AM	
A	180 pF	180 pF		
A	180 pF	180 pF		
A	NA	NA		
A	NA	NA		
A	620	620	510	
A	NA	2.75 kHz LSB	NA	
A	NA	22 pF	NA	
A	NA	22 pF	NA	
A	NA	NA	NA	
A	NA	NA	NA	
A	kHz AM	6 kHz AM	3 kHz AM	0.25 kHz USB
A	360 pF	360 pF	360 pF	
A	390 pF	390 pF	360 pF	
A	390 pF	390 pF	NA	
A	50 pF	360 pF	NA	
A	30	430	680	510

635-0441-001

Filter, Schematic Diagram
Figure 4 (Sheet 3)



NOTES:

- 1 UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, INDUCTANCE VALUES ARE IN MICROHENRYS, DIODES ARE TYPE 1N4454, AND FETS ARE TYPE SPF557.
- 2 PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATIONS
- 3 THE FOLLOWING COMPONENTS ARE PART OF ASSEMBLY 637-2515-XXX
FL2 FL7
C3, 6, 10, 13, 17, 20; 24, 27, 31, 34, 38, 41
C54-65
R7, 14, 21, 28, 35, 42
CR11
- 4 TEST SELECT RESISTOR 637-1468-001 MAY BE USED AS REQUIRED BY PRODUCTION TEST METHOD
- 5 THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- 6 TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.

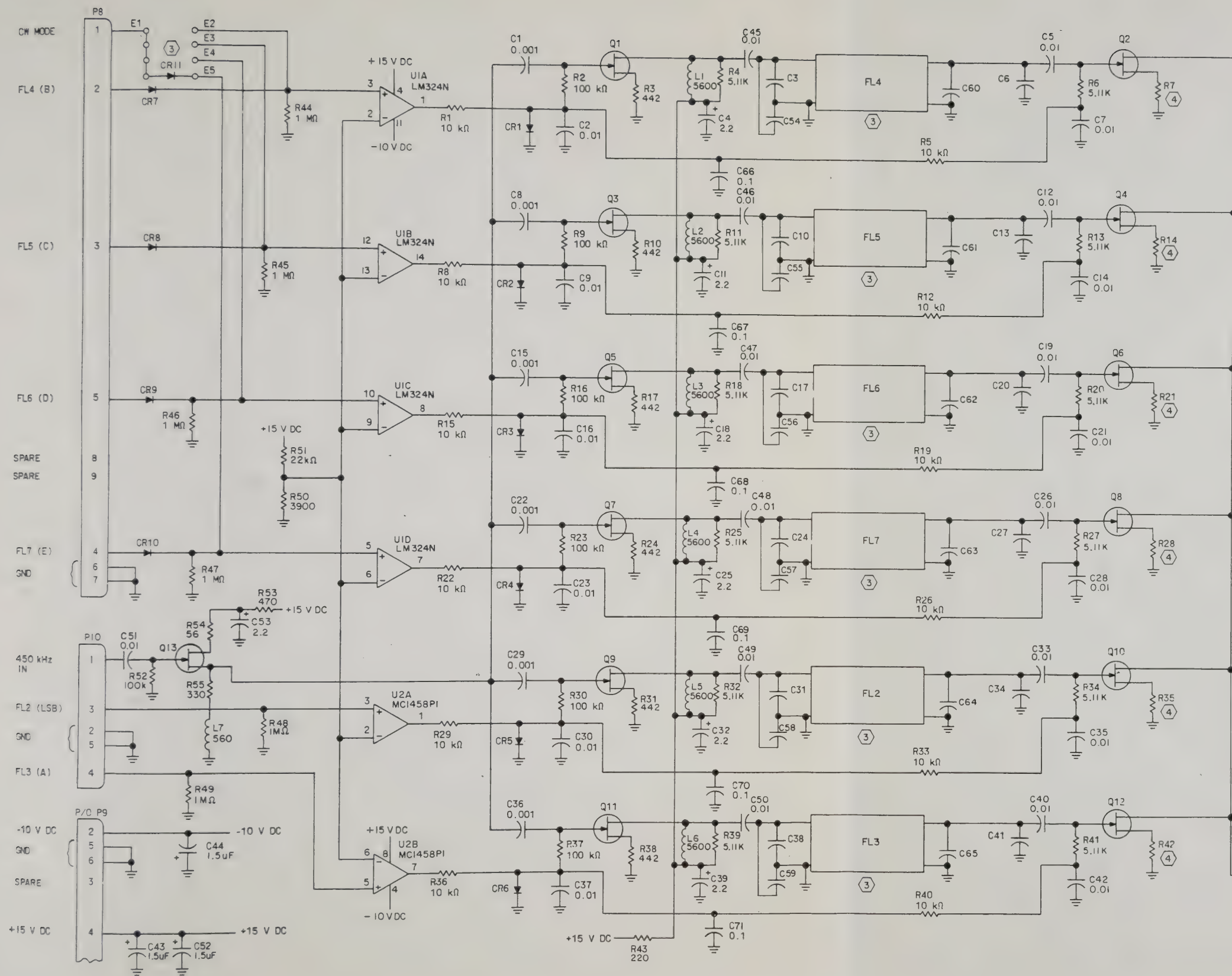
3

REF DES	637-2515-()											
	-001	-002	-003	-005	-006	-008	-009	-010	-011	-012	-013	
CR11	NA	E1-E5	NA	NA	NA	NA	NA	NA	NA	NA	NA	
FL4	3 kHz AM	NA	3 kHz AM	3 kHz AM	3 kHz AM	NA	NA	NA	NA	1 kHz AM	0.7 kHz USB	
C3	360 pF	NA	360 pF	360 pF	360 pF	NA	NA	NA	NA	110 pF		
C6	360 pF	NA	360 pF	360 pF	360 pF	NA	NA	NA	NA	110 pF		
C54	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
C60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
R7	680	NA	680	680	680	NA	NA	NA	NA	560	510	
FL5	1 kHz AM	NA	1 kHz USB	1 kHz AM	1 kHz AM	NA	1 kHz AM	NA	1 kHz AM	0.5 kHz AM	0.7 kHz LSB	
C10	110 pF	NA	110 pF	110 pF	110 pF	NA	110 pF	NA	110 pF	270 pF		
C13	110 pF	NA	110 pF	110 pF	110 pF	NA	110 pF	NA	110 pF	270 pF		
C55	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
C61	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
R14	560	NA	560	560	560	NA	560	NA	560	680	510	
FL6	0.5 kHz AM	NA	0.5 kHz USB	0.5 kHz AM	0.5 kHz AM	NA	NA	NA	NA	0.3 kHz AM	0.25 kHz LSB	
C17	270 pF	NA	100 pF	270 pF	270 pF	NA	NA	NA	NA	100 pF		
C20	270 pF	NA	100 pF	270 pF	270 pF	NA	NA	NA	NA	100 pF		
C56	NA	NA	150 pF	NA	NA	NA	NA	NA	NA	100 pF		
C62	NA	NA	150 pF	NA	NA	NA	NA	NA	NA	100 pF		
R21	680	NA	510	680	680	NA	NA	NA	NA	430	510	
FL7	0.2 kHz AM	0.2 kHz USB	0.2 kHz USB	0.2 kHz AM	0.1 kHz AM	0.37 kHz USB	0.2 kHz USB	NA	0.2 kHz AM	0.2 kHz AM	5 kHz AM	
C24	180 pF	180 pF	180 pF	180 pF	NA	220 pF	180 pF	NA	180 pF	180 pF		
C27	180 pF	180 pF	180 pF	180 pF	NA	220 pF	180 pF	NA	180 pF	180 pF		
C57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
C63	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
R28	620	620	620	620	820	620	620	NA	620	620	510	
FL2	NA	NA	NA	2.75 kHz LSB	NA	NA	2.75 kHz LSB	NA	NA	2.75 kHz LSB	NA	
C31	NA	NA	NA	22 pF	NA	NA	22 pF	NA	NA	22 pF	NA	
C34	NA	NA	NA	22 pF	NA	NA	22 pF	NA	NA	22 pF	NA	
C58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
C64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
R35	NA	NA	NA	680	NA	NA	680	NA	NA	680	NA	
FL3	6 kHz AM	6 kHz AM	6 kHz AM	6 kHz AM	6 kHz AM	NA	NA	6 kHz AM	6 kHz AM	3 kHz AM	0.25 kHz USB	
C38	360 pF	360 pF	360 pF	360 pF	360 pF	NA	NA	360 pF	360 pF	360 pF		
C41	390 pF	390 pF	390 pF	390 pF	390 pF	NA	NA	390 pF	390 pF	360 pF		
C59	390 pF	390 pF	390 pF	390 pF	390 pF	NA	NA	390 pF	390 pF	NA		
C65	360 pF	360 pF	360 pF	360 pF	360 pF	NA	NA	360 pF	360 pF	NA		
R42	430	430	430	430	430	NA	NA	430	430	680	510	

P/O P9
1 450 kHz OUT

LAST USED
R55, C71, CR11, U2, Q13, L7

Filter, Schematic Diagram
Figure 4 (Sheet 3)



NOTES:

- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, INDUCTANCE VALUES ARE IN MICROHENRYS, DIODES ARE TYPE 1N4454, AND FETS ARE TYPE SPF557.
- ② PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATIONS
- ③ THE FOLLOWING COMPONENTS ARE PART OF ASSEMBLY 637-2515-XXX
 FL2 FL7
 C3, 6, 10, 13, 17, 20, 24, 27, 31, 34, 38, 41
 C54-65
 R7, 14, 21, 28, 35, 42
 CR11
- ④ TEST SELECT RESISTOR 637-1468-001 MAY BE USED AS REQUIRED BY PRODUCTION TEST METHOD

③

REF DES	637-2515-()					
	-001	-002	-003	-005	-006	-008
CR11	NA	E1-E5	NA	NA	NA	NA
FL4	3 kHz AM	NA	3 kHz AM	3 kHz AM	3 kHz AM	NA
C3	360 pF	NA	360 pF	360 pF	360 pF	NA
C6	360 pF	NA	360 pF	360 pF	360 pF	NA
C54	NA	NA	NA	NA	NA	NA
C60	NA	NA	NA	NA	NA	NA
R7	680	NA	680	680	680	NA
FL5	1 kHz AM	NA	1 kHz USB	1 kHz AM	1 kHz AM	NA
C10	110 pF	NA	110 pF	110 pF	110 pF	NA
C13	110 pF	NA	110 pF	110 pF	110 pF	NA
C55	NA	NA	NA	NA	NA	NA
C61	NA	NA	NA	NA	NA	NA
R14	560	NA	560	560	560	NA
FL6	0.5 kHz AM	NA	0.5 kHz USB	0.5 kHz AM	0.5 kHz AM	NA
C17	270 pF	NA	100 pF	270 pF	270 pF	NA
C20	270 pF	NA	100 pF	270 pF	270 pF	NA
C56	NA	NA	150 pF	NA	NA	NA
C62	NA	NA	150 pF	NA	NA	NA
R21	680	NA	510	680	680	NA
FL7	0.2 kHz AM	0.2 kHz USB	0.2 kHz USB	0.2 kHz AM	0.1 kHz AM	0.37 kHz USB
C24	180 pF	180 pF	180 pF	180 pF	NA	220 pF
C27	180 pF	180 pF	180 pF	180 pF	NA	220 pF
C57	NA	NA	NA	NA	NA	NA
C63	NA	NA	NA	NA	NA	NA
R28	620	620	620	620	820	620
FL2	NA	NA	NA	2.75 kHz LSB	NA	NA
C31	NA	NA	NA	22 pF	NA	NA
C34	NA	NA	NA	22 pF	NA	NA
C58	NA	NA	NA	NA	NA	NA
C64	NA	NA	NA	NA	NA	NA
R35	NA	NA	NA	680	NA	NA
FL3	6 kHz AM	6 kHz AM	6 kHz AM	6 kHz AM	6 kHz AM	NA
C38	360 pF	360 pF	360 pF	360 pF	360 pF	NA
C41	390 pF	390 pF	390 pF	390 pF	390 pF	NA
C59	390 pF	390 pF	390 pF	390 pF	390 pF	NA
C65	360 pF	360 pF	360 pF	360 pF	360 pF	NA
R42	430	430	430	430	430	NA

P/O P9
1 450 kHz OUT

LAST USED
R55, C71, CR11, U2, Q13, L7

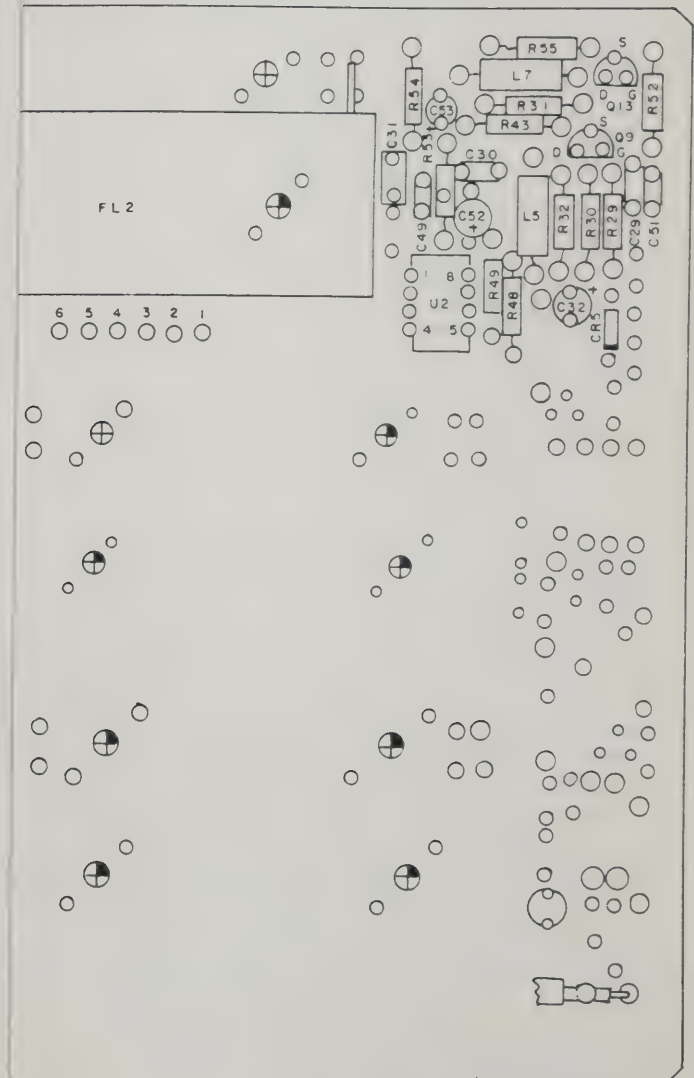
Filter, Schematic Diagram
Figure 4 (Sheet 4)

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Added 820 Ω , 910 Ω , and 1 k Ω resistors to list of test selects.	638-1468-001, REV A and above.
A2	Changed C24 and C27 from 180 pF to 220 pF.	637-2515-008, REV H and above.
A3	Changed R21 from 510 Ω to 680 Ω .	637-2515-001, -005, -006, REV J and above.
A4	Changed R28 from 470 Ω to 620 Ω .	637-2515-001, -002, -003, -005, -008, -009, REV J and above.
A5	Changed R28 from 470 Ω to 820 Ω .	637-2515-006, REV J and above.
A6	Changed R35 from 470 Ω to 680 Ω .	637-2515-005, -009 REV J and above.
None	Corrected schematic values of C45 through C51.	All units.

MODIFICATION HISTORY

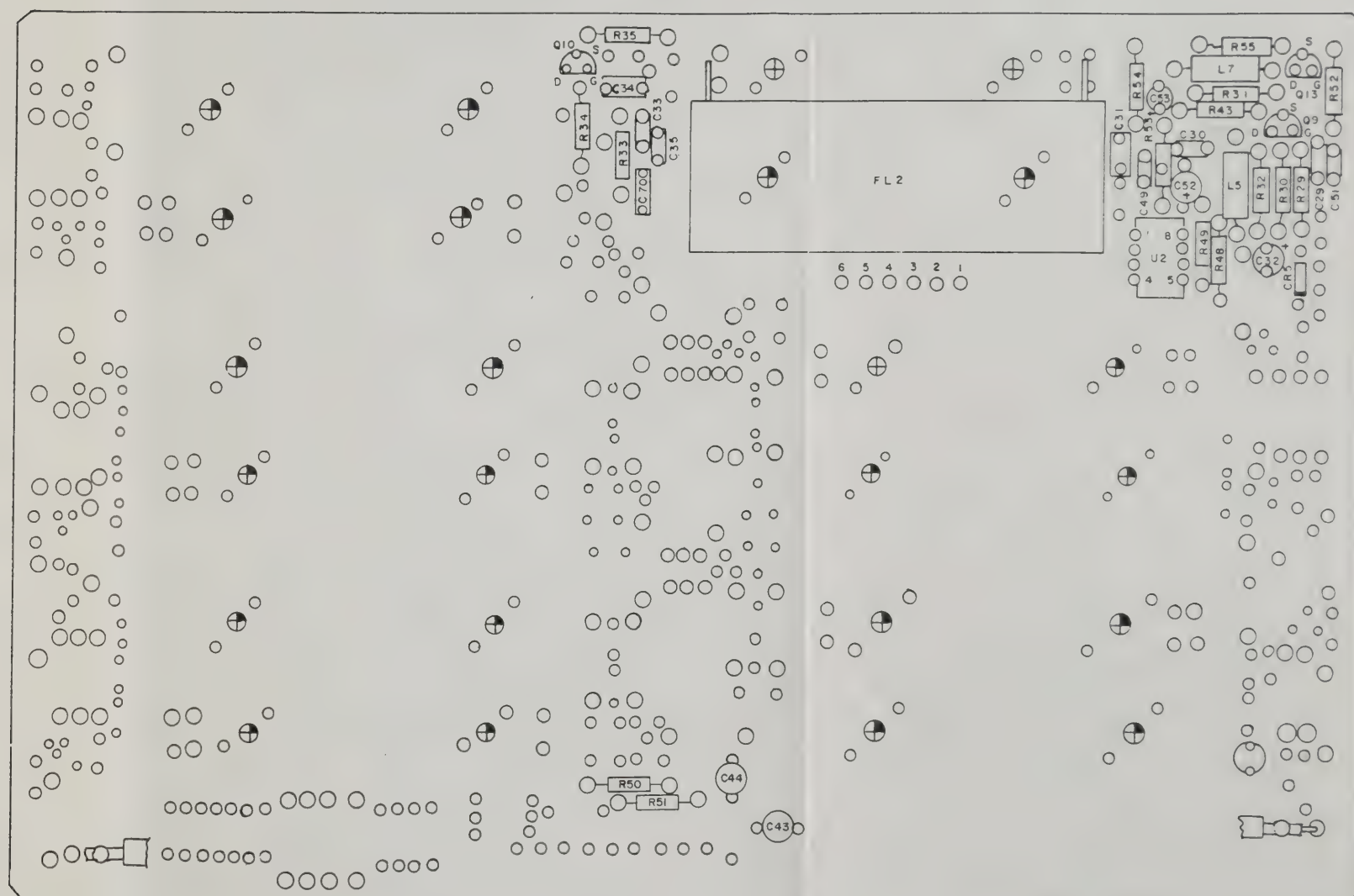
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Added 820 Ω , 910 Ω , and 1 k Ω resistors to list of test selects.	638-1468-001, REV A and above.
A2	Changed C24 and C27 from 180 pF to 220 pF.	637-2515-008, REV H and above.
A3	Changed R21 from 510 Ω to 680 Ω .	637-2515-001, -005, -006 REV J and above.
A4	Changed R28 from 470 Ω to 620 Ω .	637-2515-001, -002, -003, -005, -008, -009 REV J and above.
A5	Changed R28 from 470 Ω to 820 Ω .	637-2515-006, REV J and above.
A6	Changed R35 from 470 Ω to 680 Ω .	637-2515-005, -009 REV J and above.
None	Corrected schematic values of C45 through C51.	All units.



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2695-019

Filter (637-2515-004, -007), Schematic Diagram
Figure 5 (Sheet 1 of 3)



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2695-019

Filter (637-2515-004, -007), Schematic Diagram
Figure 5 (Sheet 1 of 3)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
	FILTER	637-2515-004 A		
	FILTER	637-2515-007 B		
C1-C30	NOT USED			
C31	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030 A		93790
C31	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430 B		93790
C32,C33	NOT USED			
C34	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030 A		93790
C34	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430 B		93790
FL1	NOT USED			
FL2	FILTER, BANDPASS, 2.75KHZ, LSB	526-9956-010 A		
FL2	FILTER, BANDPASS 0.2KHZ, AM	526-9974-010 B		
R1-R34	NOT USED			
R35	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W (A6)	745-0737-000 A		81349
R35	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000 A		81349
R35	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W (A7)	745-0737-000 B		81349
R35	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 1/4W	745-0741-000 B		81349
R35	RESISTOR, TEST SELECT	638-1468-001		
	RESISTOR,FXD CHPSN, 200 OHMS, 5%, 1/4W	745-0723-000		81349
	RESISTOR,FXD CHPSN, 220 OHMS, 5%, 1/4W	745-0724-000		81349
	RESISTOR,FXD CHPSN, 240 OHMS, 5%, 1/4W	745-0726-000		81349
	RESISTOR,FXD CHPSN, 270 OHMS, 5%, 1/4W	745-0727-000		81349
	RESISTOR,FXD CHPSN, 300 OHMS, 5%, 1/4W	745-0729-000		81349
	RESISTOR,FXD CHPSN, 330 OHMS, 5%, 1/4W	745-0730-000		81349
	RESISTOR,FXD CHPSN, 360 OHMS, 5%, 1/4W	745-0732-000		81349
	RESISTOR,FXD CHPSN, 390 OHMS, 5%, 1/4W	745-0733-000		81349
	RESISTOR,FXD CHPSN, 430 OHMS, 5%, 1/4W	745-0735-000		81349
	RESISTOR,FXD CHPSN, 470 OHMS, 5%, 1/4W	745-0736-000		81349
	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W	745-0738-000		81349
	RESISTOR,FXD CHPSN, 560 OHMS, 5%, 1/4W	745-0739-000		81349
	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 1/4W	745-0741-000		81349
	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000		81349
	RESISTOR,FXD CHPSN, 750 OHMS, 5%, 1/4W	745-0744-000		81349
	RESISTOR,FXD CHPSN, 820 OHMS, 5%, 1/4W (A1)	745-0745-000		81349
	RESISTOR,FXD CHPSN, 910 OHMS, 5%, 1/4W (A1)	745-0747-000		81349
	RESISTOR,FXD CHPSN, 1K, 5%, 1/4W (A1)	745-0748-000		81349
	CIRCUIT CARD ASSY	635-0905-002		
	CIRCUIT CARD ASSY	635-0905-002		
CR1-CR4	NOT USED			
CR5	SEMICOND DEVICE	353-3644-010		03508
C1-C28	NOT USED			
C29	CAPACITOR,FXD CER DIEL, 100QPF, 10%, 200V	913-4018-000		81349
C30	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
C31	NOT USED			
C32	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289
C33	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
C34	NOT USED			
C35	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
C36-C42	NOT USED			
C43,C44	CAPACITOR,FXD TMTLM ELCTLT, 1.5UF, 20%, 35V	184-9102-800		56289
C45-C48	NOT USED			
C49	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
C50	NOT USED			
C51	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
C52	CAPACITOR,FXD TMTLM ELCTLT, 1.5UF, 20%, 35V	184-9102-800		56289
C53	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289
C54-C69	NOT USED			
C70	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
L1-L4	NOT USED			
L5	COIL,RF 5600UH	240-2715-580		96906
L6	NOT USED			
L7	COIL,RF 560UH	240-2715-460		96906
Q1-Q8	NOT USED			
Q9,Q10	TRANSISTOR (ESOS)	352-1068-010		04713
Q11,Q12	NOT USED			
Q13	TRANSISTOR (ESOS)	352-1068-010		04713
R1-R28	NOT USED			
R29	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349
R30	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R31	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W	705-0979-000		81349
R32	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W	705-1030-000		81349
R33	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349
R34	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W	705-1030-000		81349
R35-R42	NOT USED			
R43	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349
R44-R47	NOT USED			
R48,R49	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R50	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/4W	745-0770-000		81349
R51	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349
R52	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R53	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349
R54	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0784-000		81349
R55	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349
U1	NOT USED			
U2	INTEGRATED CIRCUIT QPNL AMPLIFIER	351-1071-070		07263

1 USED IF FILTER SECTION DOES NOT MEET SPECIFICATIONS/GAIN

ematic Diagram

2)

PARTS LIST

MODIFICATION HISTORY

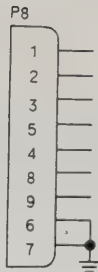
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	FILTER	637-2515-004 A			
	FILTER	637-2515-007 B			
C1-C30	NOT USED				
C31	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030 A		93790	CDSEC220D0
C31	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430 B		93790	CD5FY181J0
C32,C33	NOT USED				
C34	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030 A		93790	CDSEC220D0
C34	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430 B		93790	CD5FY181J0
FL1	NOT USED				
FL2	FILTER, BANDPASS, 2.75KHZ, LSB	526-9956-010 A		526-9956-010	
FL2	FILTER, BANDPASS 0.2KHZ, AM	526-9974-010 B			
R1-R34	NOT USED				
R35	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W (A6)	745-0737-000 A		81349	RCR07G471KS
R35	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000 A		81349	RCR07G681JS
R35	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W (A7)	745-0737-000 B		81349	RCR07G471KS
R35	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 1/4W	745-0741-000 B		81349	RCR07G621JS
R35	RESISTOR, TEST SELECT	638-1468-001			
	RESISTOR,FXD CHPSN, 200 OHMS, 5%, 1/4W	745-0723-000		81349	RCR07G201JS
	RESISTOR,FXD CHPSN, 220 OHMS, 5%, 1/4W	745-0724-000		81349	RCR07G221JS
	RESISTOR,FXD CHPSN, 240 OHMS, 5%, 1/4W	745-0726-000		81349	RCR07G241JS
	RESISTOR,FXD CHPSN, 270 OHMS, 5%, 1/4W	745-0727-000		81349	RCR07G271JS
	RESISTOR,FXD CHPSN, 300 OHMS, 5%, 1/4W	745-0729-000		81349	RCR07G301JS
	RESISTOR,FXD CHPSN, 330 OHMS, 5%, 1/4W	745-0730-000		81349	RCR07G331JS
	RESISTOR,FXD CHPSN, 360 OHMS, 5%, 1/4W	745-0732-000		81349	RCR07G361JS
	RESISTOR,FXD CHPSN, 390 OHMS, 5%, 1/4W	745-0733-000		81349	RCR07G391JS
	RESISTOR,FXD CHPSN, 430 OHMS, 5%, 1/4W	745-0735-000		81349	RCR07G431JS
	RESISTOR,FXD CHPSN, 470 OHMS, 5%, 1/4W	745-0736-000		81349	RCR07G471JS
	RESISTOR,FXD CHPSN, 510 OHMS, 5%, 1/4W	745-0738-000		81349	RCR07G511JS
	RESISTOR,FXD CHPSN, 560 OHMS, 5%, 1/4W	745-0739-000		81349	RCR07G561JS
	RESISTOR,FXD CHPSN, 620 OHMS, 5%, 1/4W	745-0741-000		81349	RCR07G621JS
	RESISTOR,FXD CHPSN, 680 OHMS, 5%, 1/4W	745-0742-000		81349	RCR07G681JS
	RESISTOR,FXD CHPSN, 750 OHMS, 5%, 1/4W	745-0744-000		81349	RCR07G751JS
	RESISTOR,FXD CHPSN, 820 OHMS, 5%, 1/4W (A1)	745-0745-000		81349	RCR07G821JS
	RESISTOR,FXD CHPSN, 910 OHMS, 5%, 1/4W (A1)	745-0747-000		81349	RCR07G911JS
	RESISTOR,FXD CHPSN, 1K, 5%, 1/4W (A1)	745-0748-000		81349	RCR07G102JS
	CIRCUIT CARD ASSY	635-0905-002			
	CIRCUIT CARD ASSY	635-0905-002			
CR1-CR4	NOT USED				
CR5	SEMICONO DEVICE	353-3644-010		01308	1M4454GE
C1-C28	NOT USED				
C29	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C30	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C31	NOT USED				
C32	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990225X00250B1
C33	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C34	NOT USED				
C35	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C36-C42	NOT USED				
C43,C44	CAPACITOR,FXD TMTLM ELCTLT, 1.5UF, 20%, 35V	184-9102-800		56289	1990155X00350E3
C45-C48	NOT USED				
C49	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C50	NOT USED				
C51	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C52	CAPACITOR,FXD TMTLM ELCTLT, 1.5UF, 20%, 35V	184-9102-800		56289	1990155X00350E3
C53	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-220		56289	1990225X00250B1
C54-C69	NOT USED				
C70	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
L1-L4	NOT USED				
L5	COIL,RF 540UH	240-2713-580		96906	MS75089-32
L6	NOT USED				
L7	COIL,RF 540UH	240-2713-460		96906	MS75089-20
Q1-Q8	NOT USED				
Q9,Q10	TRANSISTOR (ESDS)	352-1068-010		04713	SPF557
Q11,Q12	NOT USED				
Q13	TRANSISTOR (ESDS)	352-1068-010		04713	SPF557
Q1-R28	NOT USED				
R29	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R30	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R31	RESISTOR,FXD FILM, 442 OHMS, 1%, 1/8W	705-0979-000		81349	RN55D4420F
R32	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN55D5111F
R33	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R34	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN55D5111F
R35-R42	NOT USED				
R43	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R44-R47	NOT USED				
R48,R49	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R50	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/4W	745-0770-000		81349	RCR07G392KS
R51	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R52	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R53	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR07G471KS
R54	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0794-000		81349	RCR07G560KS
R55	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
U1	NOT USED				
U2	INTEGRATED CIRCUIT OPNL AMPLIFIER	351-1071-070		07263	UA1458TC

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A6	Changed R35 from 470 Ω to 680 Ω .	637-2515-004, REV J and above.
A7	Changed R35 from 470 Ω to 620 Ω .	637-2515-007, REV J and above.
None	Corrected Schematic value of C49.	All units

! USED IF FILTER SECTION DOES NOT MEET SPECIFICATIONS/GAIN

Filter (637-2515-004, -007), Schematic Diagram
Figure 5 (Sheet 2)

CW MODE
FL4 (B)
FL5 (C)
FL6 (D)
FL7 (E)
SPARE
SPARE
GROUND
GROUND



LESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, INDUCTANCE VALUES ARE IN MICROHENRYS, DIODES ARE PE IN4454, AND FETS ARE TYPE SPF557.

PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATIONS.

THE FOLLOWING COMPONENTS ARE PART OF ASSEMBLY 637-2515-004.

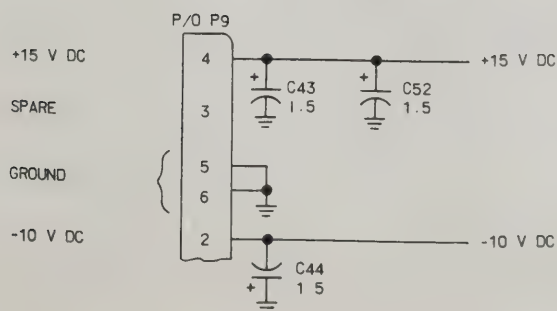
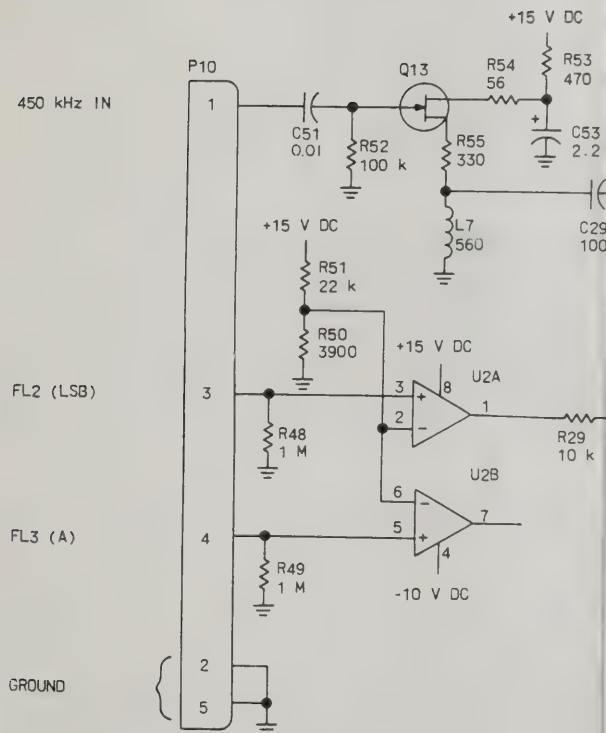
FL2
C31,34,58,64
R35

SELECT RESISTOR 637-1468-001 MAY BE USED AS REQUIRED BY PRODUCTION METHOD.

THIS DRAWING TO BE USED WITH 635-0905-002 AND ASSEMBLY 637-2515-004.

IF THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES, SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

THE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.



635-0441-002

Filter (637-2515-004, -007), Schematic Diagram
Figure 5 (Sheet 3)



**Rockwell
International**

instructions

RF Translator (637-1767-())

Collins Telecommunications Products Division

523-0767959-302211

2nd Edition, 1 June 1978

3rd Revision, 1 January 1981

Printed in USA

RF Translator
(637-1767-())

1. DESCRIPTION

RF Translator 637-1767-(), shown in figure 1, is a module enclosed in an rf secure compartment (metal box construction). The rf translator module contains a metal box subassembly with internal shielding between various circuit elements and three 2-layer planar cards. It uses a 56-pin edge-on connector (2 layers, 28 pins each) and four subminiature rf connectors for external connections.

The rf translator module consists of two mixers, a receive overload, and rf filter circuits.

The rf translator configuration differences are as follows:

- 637-1767-001, FL14, 109.350 00-MHz filter, ± 7.50 kHz at 3-dB points (narrow-band filter).
- 637-1767-002, FL14, 109.350 00 MHz filter, ± 6.10 kHz at 0.5-dB points (broadband filter).
- 637-1767-003, FL14, 109.350 00-MHz filter, ± 6.00 kHz at 1-dB points. High performance front end has +35-dB mW third-order intercept point.

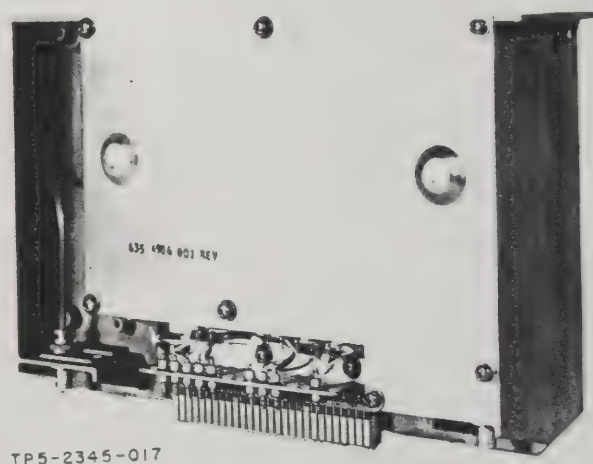
2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 2.)

The rf translator converts the 100-kHz (0.100-MHz) to 30.0-MHz receive rf input to a 9.45-MHz receive if frequency.

2.2 Receive Function (Refer to figure 2.)

When a receive signal is supplied to the rf translator, it is overload checked and supplied through K1 to the associated bandpass filter. If an overload exists, Q1 causes K1 to deenergize, and the receive rf is loaded



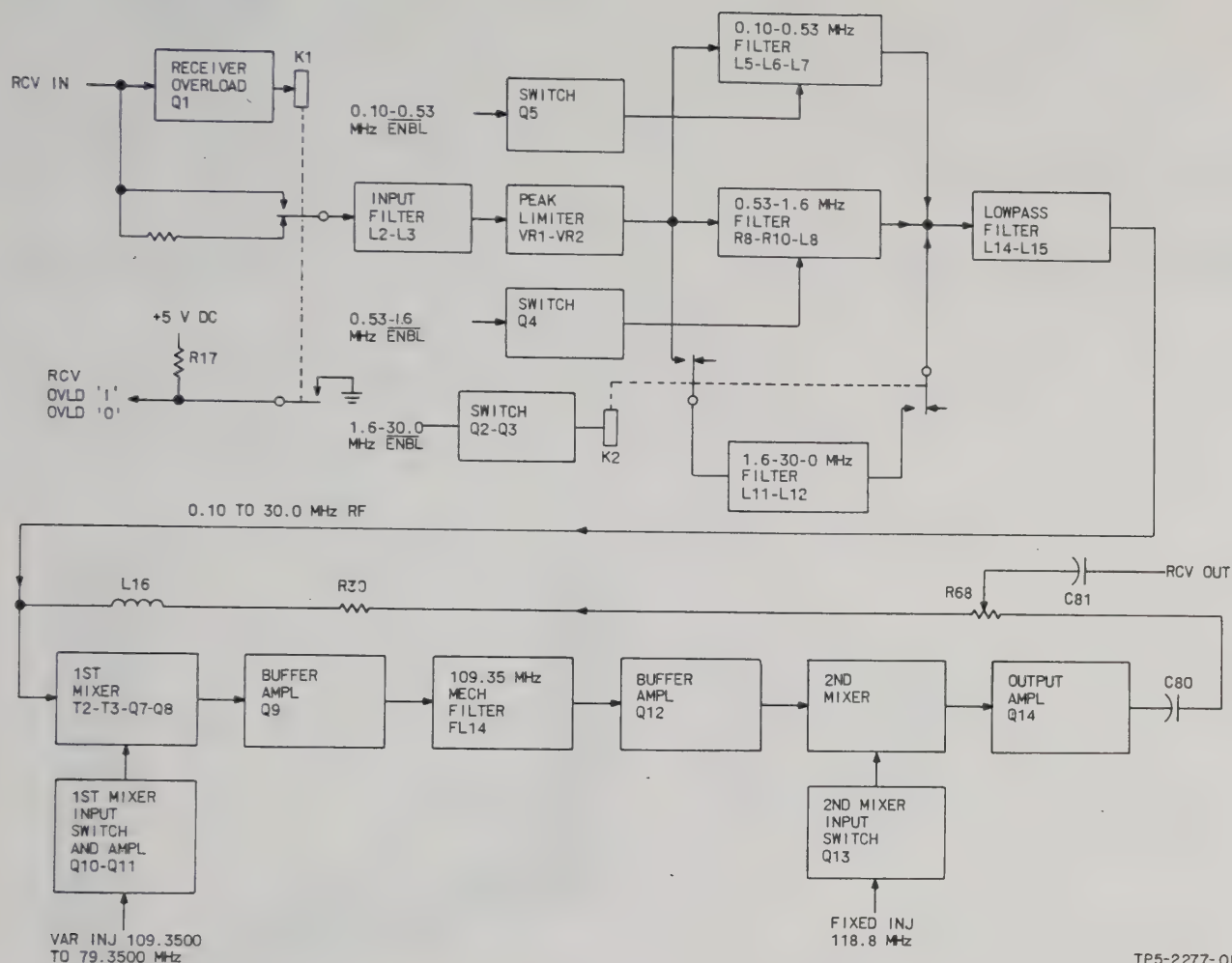
RF Translator
Figure 1

through R4 and supplied as receive rf through K1 to the associated bandpass filter.

The bandpass filter is selected by the receiver frequency control. Enable signals from the receiver frequency control enable filter L5-L7 for 100- to 530-kHz (0.10- to 0.53-MHz) operation; enable filter R8-R10-L8 for 530-kHz to 1.6-MHz (0.53- to 1.6-MHz) operation; and energize K2 to enable filter L11-L12 for 1.6- to 30.0-MHz operation.

The signal from K1 is supplied through the selected bandpass filter and through low-pass filter L14-L15 to the grounded gate balanced FET first mixer circuit T1-T2, Q7-Q8.

In the first mixer the 100-kHz to 30.0-MHz signal is mixed with a 109.3500- to 79.3500-MHz variable injection signal to provide a 109.35-MHz if signal. This signal is supplied through FET buffer amplifier Q9, mechanical filter FL14, and a second FET buffer amplifier Q12 to the second mixer circuit.



Functional Block Diagram
Figure 2

In the second mixer the 109.35-MHz if signal is mixed with a 118.8-MHz fixed injection signal to provide a 9.45-MHz receive if output signal. The receive if output signal is supplied through output amplifier Q14 and output control R68 to the rf translator receive if output.

2.3 RF Mixer SRA-1 (Refer to figure 3.)

The SRA-1 is a broadband ring modulator mixer device used in 50-ohm rf/if applications.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the rf translator module are

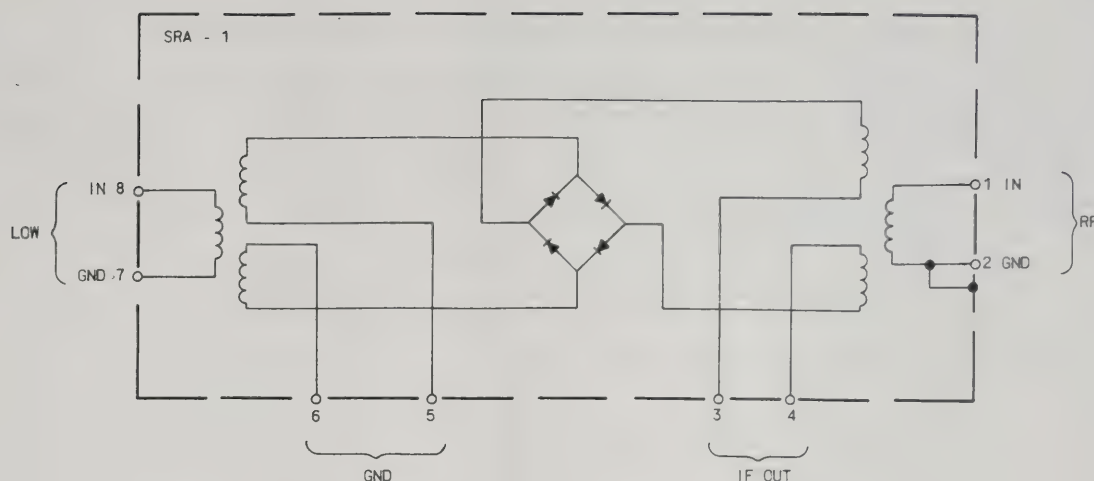
listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 1 check total performance of the rf translator module. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

Note

In emergencies, RF Translator 637-1767-001 can be replaced by RF Translator 635-4903-001. In this type of repair, use the test procedures given in table 1 to test RF Translator 635-4903-001.



CHARACTERISTICS

PEAK INPUT POWER: 50 mW MAX.
 PEAK CURRENT, ANY PORT: 40 mA MAX.
 FREQUENCY RANGE (MHz):
 LOW - 0.5 TO 500
 RF - 0.5 TO 500
 IF - DC TO 500
 CONVERSION LOSS: 6.5 dB TYPICAL,
 8.5 dB MAX. (SIGNAL AT IF PORT,
 OUTPUT AT RF PORT)
 TEST CURRENT WHEN CHECKING
 CONTINUITY MUST NOT EXCEED 20 mA.

ISOLATION (dB):

LOW BAND EDGE;
 LOW TO RF - 35 dB MIN.
 LOW TO IF - 30 dB MIN.
 MID-RANGE;
 LOW TO RF - 30 dB MIN.
 LOW TO IF - 25 dB MIN.
 UPPER BAND EDGE;
 LOW TO RF - 25 dB MIN.
 LOW TO IF - 20 dB MIN.

TP5-2278-013

RF Mixer SRA-1
 Figure 3

Table 1. RF Translator, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit containing the rf translator that is to be tested. b. Remove rf translator. Install rf translator on extender and place it in the unit. c. Set unit LINE SELECTOR switch to 115 V. d. Connect unit to 115-V ac power source and set power on. e. Measure dc voltages between the following pins and ground (P1-1, 28, 29, 56): P1-25 P1-53 P1-23 P1-51 P1-27 P1-6	} +24.0 $\pm$ 1.0 V dc } +15.0 $\pm$ 1.0 V dc +5.0 $\pm$ 0.2 V dc -15.0 $\pm$ 1.0 V dc	Check associated power supply.

Table 1. RF Translator, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. Receiver SSB sensitivity	a. Set front panel MODE switch to SSB/CW and BANDWIDTH switch to USB. b. Connect an rf signal generator to J1 (RW ANT jack on rear panel). c. Connect an audio vtvm to A6TP2 (SSB audio). d. Set the rf signal generator to 250.0 kHz and receiver front panel frequency controls to 249.0 kHz. e. Set the rf signal generator level at 0.00 μV. f. Note noise level on audio vtvm. g. Adjust rf signal generator level to 0.30 μV and note signal level on audio vtvm. h. Repeat steps e, f, and g with rf signal generator at each of the following frequencies: (receiver front panel frequency controls set 1000 Hz below each frequency given). 500 kHz 1.0 MHz 1.6 MHz 5.0 MHz 10.0 MHz 15.0 MHz 20.0 MHz 25.0 MHz 30.0 MHz	Reference NLT 2 dB above reference Note Signal strength of step g varies with frequency. NLT 3 dB above reference NLT 3 dB above reference NLT 10.5 dB above reference NLT 10.5 dB above reference NLT 10.5 dB above reference NLT 10.5 dB above reference NLT 10.5 dB above reference NLT 10.5 dB above reference NLT 10.5 dB above reference NLT 10.5 dB above reference	Check M1, Q14, Q12, FL14, Q9, Q8, Q7, Q5, and associated circuits. Same as step g. Check Q4 and associated circuits. Check Q2, Q3, K2, and associated circuits. Same as 1.6 MHz.
3. Receiver gain	a. Connect an rf signal generator to J1 (RCV ANT jack on rear panel). b. Connect an rf vtvm (with 50-Ω load) to J3. c. Set the rf signal generator and receiver front panel frequency controls to 1.600 MHz. d. Set the rf signal generator level at -30 dB mW.		
(Cont)			

Table 1. RF Translator, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	e. Note the signal level on the rf vtm. f. Repeat steps d and e at each of the following frequencies: 5.0 MHz 10.0 MHz 15.0 MHz 20.0 MHz 25.0 MHz 29.9 MHz	NLT -12.0 dB mW NLT -11.5 dB mW NLT -11.5 dB mW NLT -10.1 dB mW NLT -11.5 dB mW NLT -11.5 dB mW NLT -11.1 dB mW	Same as test 2.
4. Receiver overload protection	a. Connect an rf signal generator to J1 (RCV ANT jack on rear panel). b. Connect a dvm to P1-3. Note voltage. c. Set the rf signal generator and the receiver front panel frequency controls to 500 kHz. d. Increase the rf signal generator output level until the receive overload relay just clicks. e. Note rf output level of rf signal generator. f. Note dvm reading. g. Remove rf signal generator.	0 V 1.4 to 1.9 V rms NLT +3.0 V dc	Check Q1, K1, and associated circuits. Same as step b. Check K1 and associated output circuit.
5. Receive AGC (Cont)	a. Remove rf translator from extenders and install it in unit. b. Remove channel A if. Install it on extender card and place it in unit. c. Connect an rf signal generator to J1 (RCV ANT jack on rear panel). d. Connect an rf vtm (with high impedance probe) to J3 (A8J1). e. Set front panel AGC switch to OFF. f. Set the rf signal generator and receiver front panel frequency controls to 15.0000 MHz. g. Set the rf signal generator level at -30 dB mW. h. Note the signal level on the rf vtm. i. Set front panel AGC switch to FAST. j. Increase rf signal generator level until reference on rf vtm is reached.	Reference	

Table 1. RF Translator, Testing and Troubleshooting Procedures (Cont).

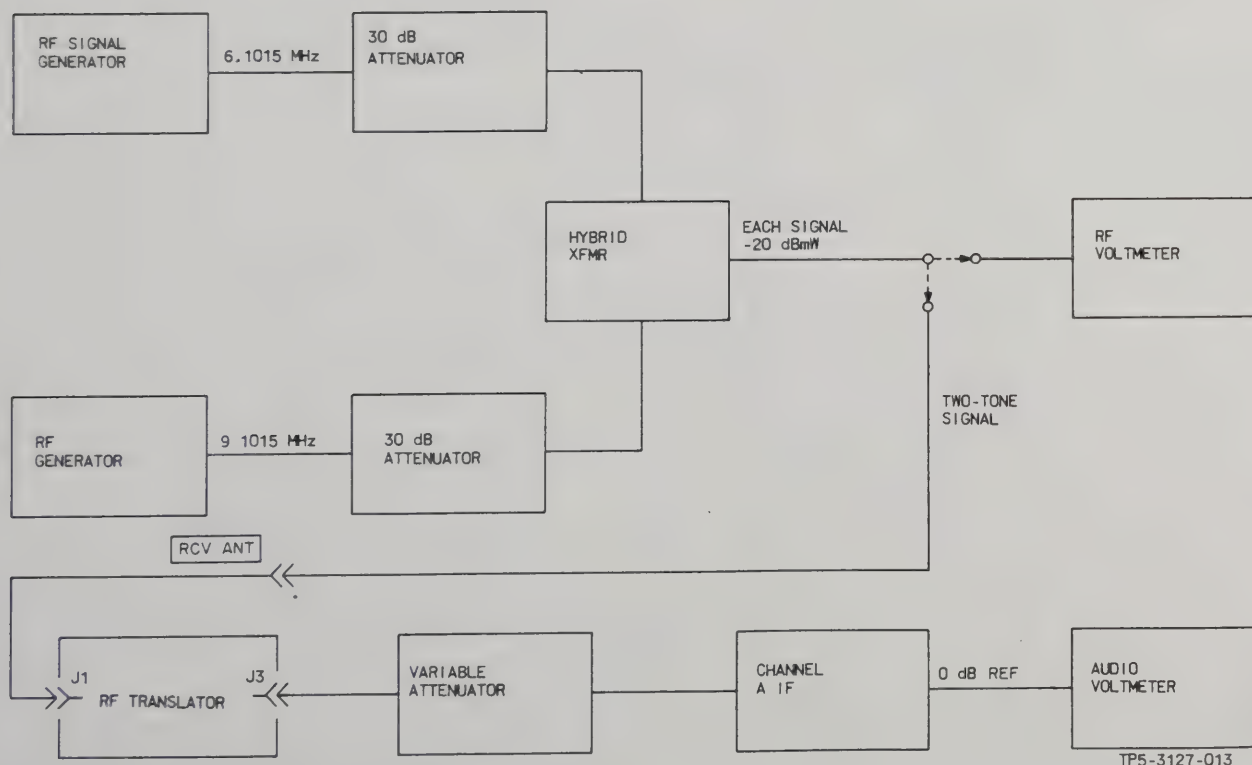
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	k. Note increase in rf signal generator level. l. Remove channel A if from extenders and install it in unit. m. Remove rf translator. Install it on extender card and place it in unit.	37 to 43 dB	Check CR19, CR20, CR22, CR23, and associated circuits.
6. Filter ripple	a. Connect an rf signal generator to J1 (RCV ANT jack on rear panel). b. Connect an rf vtvm (with 50- Ω load) to J3. c. Set the rf signal generator and receiver front panel frequency controls to 15.0000 MHz. d. Set the rf signal generator level for -10-dB mW rf vtvm reading. e. Adjust the rf signal generator down to 14.9970 MHz and up to 15.0030 MHz while noting the variation in the rf vtvm reading. f. Adjust the rf signal generator down to 14.9940 MHz and up to 15.0060 MHz while noting the variation in the rf vtvm reading.	Reference NMT 0.7-dB variation NMT 5.0-dB variation	Check M1, FL14, and associated circuits. If only slightly out of tolerance, adjustment of L24 and L20 may remedy indication. Same as step e.
7. Receiver intermodulation, 3rd order products (Cont)	a. Connect two rf signal generators to rf translator as shown in figure 4. b. Set one rf signal generator to 6.1015 MHz. c. Set the second rf signal generator to 9.1015 MHz. d. Using the rf vtvm (with 50- Ω load) connected at the output of the hybrid transformer, independently adjust each rf signal generator for -20-dB mW outputs. e. Connect the two-tone signal to J1 (RCV ANT jack on rear panel). f. Set the receiver front panel frequency controls to 3000.00 kHz. g. Slightly adjust (300 to 2000 Hz) the frequency of the 6.1015-MHz generator for a peak audio output (at A6TP2) as indicated on the audio voltmeter. h. Adjust the variable attenuator for 0-dB reference on the audio voltmeter.	Reference	

Table 1. RF Translator, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)	Note Adjust variable attenuator for a 0-dB reference at point where AGC just begins to affect the audio output. i. Note 6.1015-MHz rf signal generator output. j. Set the receiver front panel frequency controls to 6100.00 kHz. k. Slightly adjust the frequency of the 6.1015-MHz generator for a peak audio output as indicated on the audio voltmeter. l. Adjust the output level of the rf signal generator for 0-dB reference in step h on the audio voltmeter. m. Note the decrease in dB of the rf signal generator output from that referenced in step i. n. Repeat steps g through m with the receiver front panel frequency controls at each of the following settings: 12100.00 kHz 21300.00 kHz 24300.00 kHz	Reference	To repair, return to factory
8. Receiver intermodulation, 2nd order products	a. Connect two rf signal generators to rf translator as shown in figure 4. b. Set one rf signal generator to 6.1015 MHz. c. Set the second rf signal generator to 9.1015 MHz. d. Using the rf vtvn (with 50-Ω load) connected at the output of the hybrid transformer, independently adjust each rf signal generator for -20-dB mW outputs. e. Connect the two-tone signal to J1 (RCV ANT jack on rear panel). f. Set the receiver front panel frequency controls to 3000.00 kHz. g. Slightly adjust (300 to 2000 Hz) the frequency of the 6.1015-MHz generator for a peak audio output (at A6TP2) as indicated on the audio voltmeter. h. Adjust the variable attenuator for 0-dB reference on the audio voltmeter.	NLT 83 dB down NLT 83 dB down NLT 83 dB down	Same as step m.
(Cont)		Reference	

Table 1. RF Translator, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	Note Adjust variable attenuator for a 0-dB reference at point where AGC just begins to affect the audio output. i. Note 6.1015-MHz rf signal generator output. j. Set the receiver front panel frequency controls to 6100.00 kHz. k. Slightly adjust the frequency of the 6.1015-MHz generator for a peak audio output as indicated on the audio voltmeter. l. Adjust the output level on the rf signal generator for 0-dB reference in step h on the audio voltmeter. m. Note the decrease in dB of the rf signal generator output from that referenced in step i. n. Repeat steps g through m with the receiver front panel frequency controls at 15 200.00 kHz.	Reference NLT 70 dB down NLT 70 dB down	 To repair, return to factory. Same as step m.



Receive Intermodulation Test Setup
Figure 4

4. ALIGNMENT/ADJUSTMENT

4.1 Receiver Alignment (Adjustment of T3, L24, L26, and L29)

- Connect an rf signal generator through a 6-dB load to J1 (RCV ANT jack on rear panel).
- Connect an rf vtvm (with 50- Ω load) to J3.
- Set input to J1 at 15.0000 MHz and -30 dB mW.
- Set front panel controls for 15 000.0 kHz.
- Set R68 (receive gain) at full counterclockwise position.
- Adjust T3, L24, L26, and L29 for maximum output, as indicated by vf vtvm.
- Perform step f a minimum of three times.

4.2 Mixer Balance (Adjustment of R31)

- Use a dvm with a 10- μ H choke in series with a test probe to measure voltage readings at T2-2 and T2-5 to ground.
- Adjust R31 for equal dc voltage reading at T2-2 and T2-5 to ground.

4.3 Injection Level Adjustment (Adjustment of T4)

- Connect an rf vtvm (set to 10-V scale) between T2-1 and ground.
- Vary input frequency from 2.0 to 29.9 MHz, and note that voltage varies between 3.0 and 7.0 V rms and that the higher voltage readings occur between 27 and 29.9 MHz.
- If voltage exceeds the limits of step b or is higher at other than 27 to 29.9 MHz, adjust slug of T4 to achieve the desired levels.

4.4 Translator Gain Adjustment (Adjustment of R68, T1, and T2)

- Set the rf signal generator for 15.000 00 MHz at -30 dB mW and the front panel frequency controls to 15 000.00 kHz.
- Connect an rf vtvm (with 50- Ω load) to J3.
- Adjust R68 for -10-dB mW reading on the rf vtvm.
- Set the rf signal generator for 29.9000 MHz at -30 dB mW and the front panel frequency controls to 15 000.00 kHz.
- Using a pointed plastic tool, carefully adjust the leads and windings of T1 and T2 for maximum reading on the rf vtvm.

Note

The objective is to make the output at 29.900 00 MHz as large as possible with an output difference between 29.900 00 and 15.000 00 MHz of not more than 1.0 dB.

- Repeat steps c, d, and e until no improvement is possible.

4.5 Final Noise Balance (Adjustment of R31)

- Set the front panel frequency controls for 15 000.00 kHz and disconnect the rf signal generator.
- Connect an audio voltmeter to the channel A if SSB audio output. Reference the background noise level on the audio voltmeter.
- Adjust R31 (20-turn potentiometer) for a minimum noise level. Make this adjustment very slowly to assure a true minimum.

4.6 T1 and T2 Position Fixing

Note

If T1 and T2 require position fixing, it is recommended that the rf translator be returned to the factory. If field repair of T1 and T2 is desired, the following procedures may be used. Do not make these adjustments unless repair has been made to the T1 and/or T2 area of the rf translator.

- Set the rf signal generator for 29.900 00 MHz at -24 dB mW and the front panel frequency controls to 15 000.00 kHz.
- Connect an rf vtvm (with 50- Ω load) to J3. Reference the rf vtvm reading.
- Using a pipe cleaner, carefully apply a very thin coat of Q-Max to the windings of T1 and T2 and the support rods that hold T1 and T2 in position.
- After Q-Max is applied, it may be necessary to slightly readjust wires for maximum output. Refer to paragraph 4.4.

5. REPAIR

Repair of the rf translator module is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to

the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 5). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter

code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

CODE	MANUFACTURER'S NAME AND ADDRESS
00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
01526	GENERAL ELECTRIC CO DATA COMMUNICATION PRODUCTS DEPT GENERAL ELECTRIC DR WAYNESBORO VA 22980
02113	COILCRAFT INC 1102 SILVER LAKE RD CARY IL 60013
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
03550	VANGUARD ELECTRONICS CO INC 930 W HYDE PARK BLVD INGLEWOOD CA 90302
04222	AVX CERAMICS DIV OF AVX CORP 19TH AVE SOUTH P O BOX 867 MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
05375	VARI-L CO INC 3883 MONACO PKY DENVER CO 80207
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
10646	CARBORUNDUM CO THE P O BOX 337 NIAGARA FALLS NY 14302
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV PO BOX 728 855 35TH STREET NE CEDAR RAPIDS IA 52406

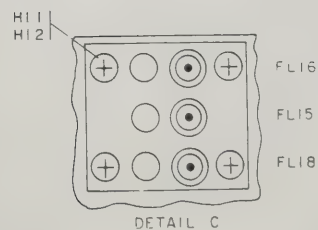
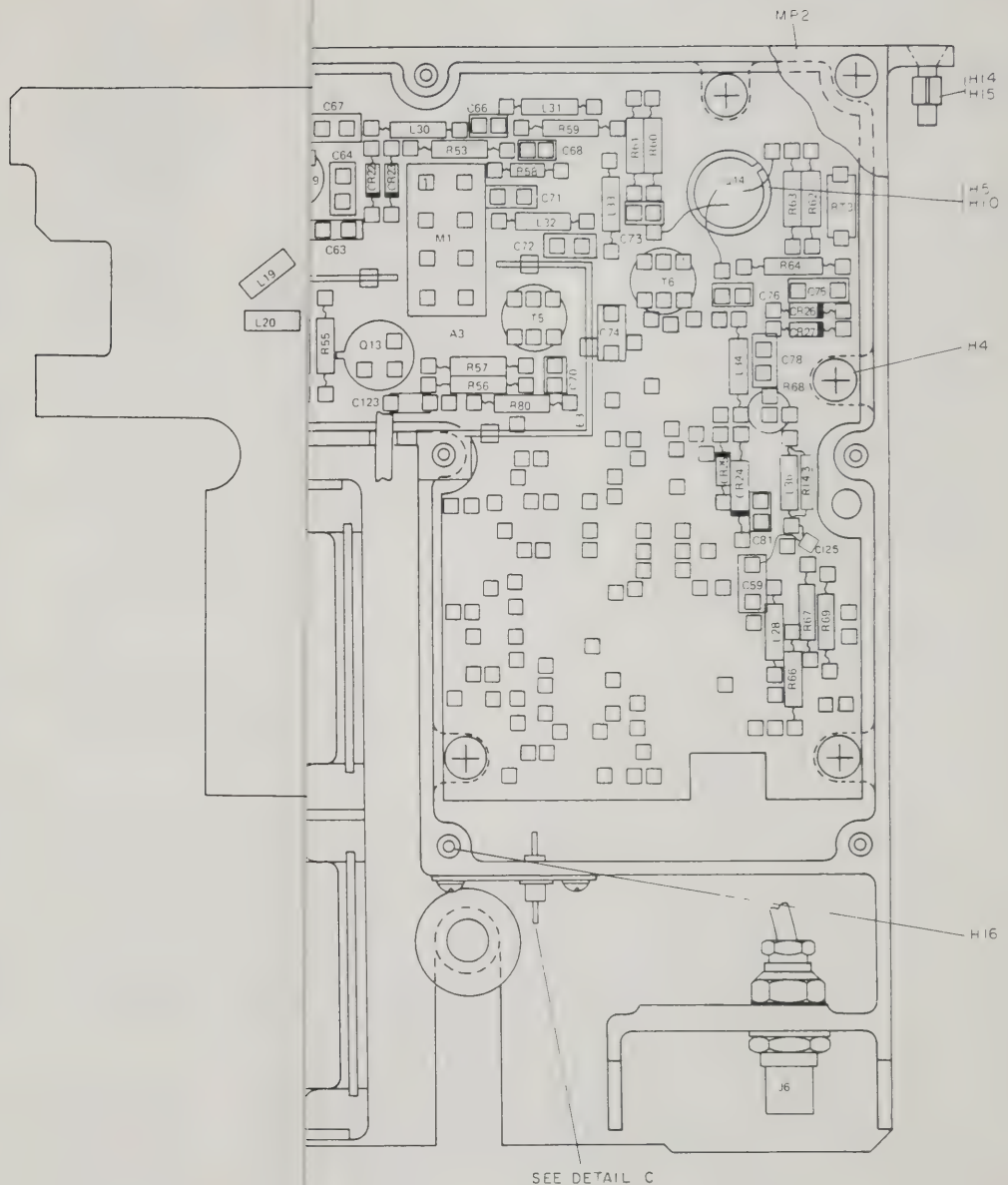
CODE	MANUFACTURER'S NAME AND ADDRESS
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054
18796	ERIE TECHNOLOGICAL PRODUCTS INC STATE COLLEGE DIV 1900 W COLLEGE AVE STATE COLLEGE PA 16801
20462	PREM ENTERPRISES INC 3519 N CHAPEL HILL MC HENRY IL 60050
28480	HEWLETT-PACKARD CO CORPORATE HQ 1501 PAGE MILL RD PALO ALTO CA 94304
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
72962	ESNA DIV OF AMERACE CORP 2330 VAUXHALL ROAD UNION NJ 07083
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV 2500 HARBOR BLVD FULLERTON CA 92634
77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905
77250	PHEOLL MFG CO DIV OF ALLIED PRODUCTS CORP 5700 W ROOSEVELT RD CHICAGO IL 60650
79807	WROUGHT WASHER MFG INC 2100 S O BAY ST MILWAUKEE WI 53207
80294	BOURNS INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
91314	LEWIS SPRING AND MFG CO 2652 W NORTH AVE CHICAGO IL 60647

CODE	MANUFACTURER'S NAME AND ADDRESS
91719	GENERAL INSTRUMENTS INC DALLAS TX 75260
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
95445	RCA CORP RCA FREQUENCY BUREAU 50 BROAD ST NEW YORK NY 10004
96095	AVX CERAMICS DIV OF AVX CORP SENECA AVE OLEAN NY 14760
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544
98978	INTERNATIONAL ELECTRONIC RESEARCH CORP 135 W MAGNOLIA BLVD BURBANK CA 91502
99800	AMERICAN PRECISION INDUSTRIES INC DELEVAN DIV 270 QUAKER RD EAST AURORA NY 14052

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

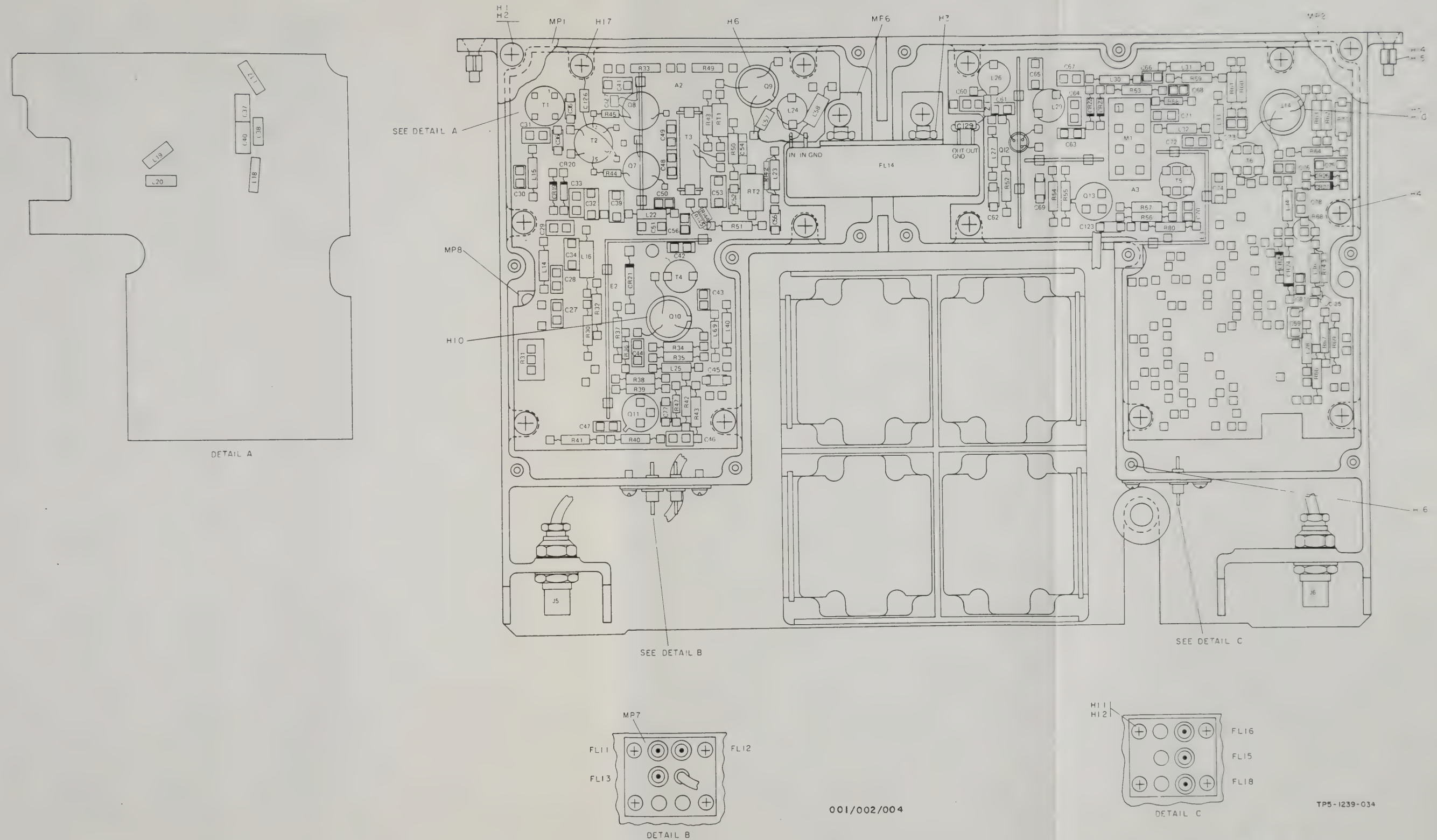
CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Rf translator module	637-1767-001	REV Y
Rf translator module	637-1767-002	REV Y
Rf translator module	637-1767-003	REV W
Rf translator module	637-1767-004	REV Y
Rf filter board A1	635-0780-002	REV L
Rf filter board A1	635-0780-004	REV P
First mixer board A2	635-0782-002	REV AB
First mixer board A2	635-0782-004	REV AB
First mixer board A2	642-3587-001	REV A
Second mixer board A3	635-0784-002	REV T



TP5-1239-034

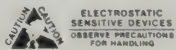


RF Translator, Schematic Diagram
Figure 5 (Sheet 1 of 9)



001/002/004

TP5-1239-034



RF Translator, Schematic Diagram
Figure 5 (Sheet 1 of 9)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	IS ON CODE	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	RF TRANSLATOR	637-1767-001 A			44-010 A,B		03508	1N4454GE
	RF TRANSLATOR	637-1767-002 B			23-010 C		03508	STB707
	RF TRANSLATOR	637-1767-003 C			44-010 A,B		03508	1N4454GE
	RF TRANSLATOR	637-1767-004 D			44-010		03508	1N4454GE
A1	RF FILTER BOARD	635-0780-002 A,B,D			44-010 A,B		03508	1N4454GE
A1	RF FILTER BOARD	635-0780-004 C			19-010 C		28480	1N5767
A2	FIRST MIXER BOARD	635-0782-002 A,D			44-010		03508	1N4454GE
A2	FIRST MIXER BOARD	635-0782-004 B			44-010 A,B		03508	1N4454GE
A2	FIRST MIXER BOARD (ESDS)	642-3587-001 C			19-010 C		28480	1N5767
A3	SECOND MIXER BOARD	635-0784-002			44-010		03508	1N4454GE
C1-C56	NOT USED				44-010 A,B		03508	1N4454GE
C57	CAPACITOR,FXD MICA DIEL, 56PF, 5%, 50V (B3)	912-4141-310 A		72136	19-010 C		28480	1N5767
C57	CAPACITOR,FXD MICA DIEL, 68PF, 5%, 50V	912-4141-330		72136	44-010		03508	1N4454GE
C57	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V (D1)	912-4141-280 C		93790	44-010 A,B		03508	1N4454GE
C58	CAPACITOR,FXD MICA DIEL, 56PF, 5%, 50V (B3)	912-4141-310 A		72136	19-010 C		28480	1N5767
C58	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-280		72136	44-010		03508	1N4454GE
C58	CAPACITOR,FXD MICA DIEL, 68PF, 5%, 50V (D1)	912-4141-330 C		93790				
C59-C125	NOT USED				44-010		03508	1N4454GE
	CAPACITOR, TEST SELECT C126				44-010 C		03508	DA27395E
C126	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (A2)	912-4141-540		72136	834-000 A,B		81349	CM05FD181J03
C126	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (A2)	912-4141-070		72136	828-000		81349	CM05FD151J03
C126	CAPACITOR,FXD MICA DIEL, 4PF, PORM 0.5PF, 300V (A2)	912-4141-080		72136	852-000		81349	CM05FD0331J03
C126	CAPACITOR,FXD MICA DIEL, 5PF, PORM 0.5PF, 300V (A2)	912-4141-010		72136	802-390		56289	1950475X00350B1
C126	CAPACITOR,FXD MICA DIEL, 6PF, PORM 0.5PF, 300V (A2)	912-4141-090		72136	879-200		16546	CY30C104M
	CAPACITOR, TEST SELECT C127				841-070		72136	DM5C0300300HV
C127	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (A8)	912-4141-060		72136	841-140		72136	DM5C0300100HV
C127	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (A8)	912-4141-540		72136	841-440 A,B		72136	DM5F201J050HV
C128	NOT USED				841-430 C		93790	CD5FY181J0
C129	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (C5)	912-4141-070 B		72136	841-360		72136	DM5F910J050HV
C130-C132	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V (B1)	184-9102-220		56289	879-200		16546	CY30C104M
C133	CAPACITOR,FXD ELCTLT, 22UF, 20%, 10V (B1)	184-9102-080		56289	879-200		16546	CY30C104M
C134-C205	NOT USED				881-170		18796	8131-100C0G332K
C206	CAPACITOR, TEST SELECT C206				884-030		56289	LP88A1V153J
C206	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	881-170		18796	8131-100C0G332K
C206	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	879-200		16546	CY30C104M
C206	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 G		93790	881-170		18796	8131-100C0G332K
C207-C210	NOT USED				881-140		18796	8131-100C0G152K
C211	CAPACITOR, TEST SELECT C211				881-170		18796	8131-100C0G332K
C211	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	841-050 A,B		72136	DM5F101J050HV
C211	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	841-330 C		93790	CD5EY680J0
C211	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 C		93790	865-090		01526	35AV1087A2
C212-C247	NOT USED				873-060		96906	MS75085-11
C248	CAPACITOR, TEST SELECT C248				845-010		99800	BP3391
C248	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	845-010		96906	MS90538-20
C248	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	840-000		96906	MS90539-15
C248	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 C		93790	840-000		96906	MS75084-17
C249	CAPACITOR, TEST SELECT C249				840-000		96906	MS90539-15
C249	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	840-000		96906	MS90538-20
C249	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	840-000		96906	MS75088-7
C249	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 C		93790	840-000		96906	MS75088-7
C250	CAPACITOR, TEST SELECT C250				840-000		96906	MS75088-8
C250	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	840-000		96906	MS75088-8
C250	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	840-000		96906	MS75088-8
C250	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 C		93790	840-000		96906	MS75088-8
C251	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (D1)	913-4018-000 C		81349	840-000		81349	RCR07G472KS
FL1-FL13	FILTER,RAD INTR 1750PF	241-5006-010		81349	840-000		81349	RCR07G222KS
FL14	FILTER,BP 109.35 MHZ	293-1222-030 A		00136	840-000		81349	RCR07G472KS
FL14	FILTER,BP 109.35 MHZ	293-1330-010 B,D		00136	840-000		81349	RCR07G102KS
FL14	FILTER,BP 109.35 MHZ	293-1222-050 C		00136	840-000		81349	RCR07G102KS
FL15, FL16	FILTER,RAD INTR 1750PF	241-5006-010		81349	840-000		81349	RCR07G472KS
FL17	NOT USED				840-000		81349	RCR07G472KS

tic Diagram
2)

PARTS LIST

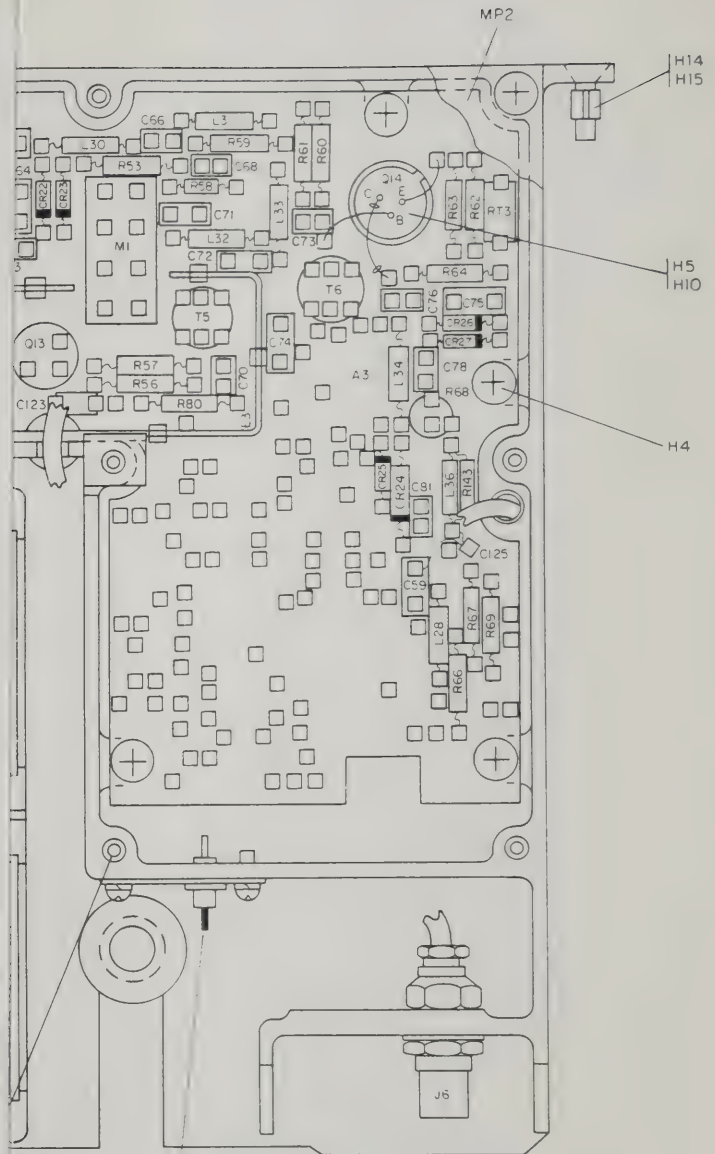
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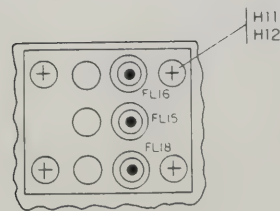
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A1 A1 A2 A2 A2 A3 C1-C56	RF TRANSLATOR	637-1767-001 A			
	RF TRANSLATOR	637-1767-002 B			
	RF TRANSLATOR	637-1767-003 C			
	RF TRANSLATOR	637-1767-004 D			
	RF FILTER BOARD	635-0780-002 A,B,D			
	RF FILTER BOARD	635-0780-004 C			
	FIRST MIXER BOARD	635-0782-002 A,D			
	FIRST MIXER BOARD	635-0782-004 B			
	FIRST MIXER BOARD (ESDS)	642-3587-001 C			
	SECOND MIXER BOARD	635-0784-002			
C57	CAPACITOR,FXD MICA DIEL, 56PF, 5%, 50V (B3)	912-4141-310 A		72136	DM5E560J050WV
C57	CAPACITOR,FXD MICA DIEL, 68PF, 5%, 50V	912-4141-330		72136	DM5E680J050WV
C57	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V (D1)	912-4141-280 C		93790	CD5EY470J0
C58	CAPACITOR,FXD MICA DIEL, 56PF, 5%, 50V (B3)	912-4141-310 A		72136	DM5E560J050WV
C58	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-280		72136	DM5E470J050WV
C58	CAPACITOR,FXD MICA DIEL, 68PF, 5%, 50V (D1)	912-4141-330 C		93790	CD5EY680J0
C59-C125	NOT USED				
C126	CAPACITOR, TEST SELECT C126				
	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (A2)	912-4141-540		72136	DM5C0200300WV
C126	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (A2)	912-4141-070		72136	DM5C0300300WV
C126	CAPACITOR,FXD MICA DIEL, 4PF, PORM 0.5PF, 300V (A2)	912-4141-080		72136	DM5C0400300WV
C126	CAPACITOR,FXD MICA DIEL, 5PF, PORM 0.5PF, 300V (A2)	912-4141-010		72136	DM5C0500300WV
C126	CAPACITOR,FXD MICA DIEL, 6PF, PORM 0.5PF, 300V (A2)	912-4141-090		72136	DM5C0600300WV
C127	CAPACITOR, TEST SELECT C127				
	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (A8)	912-4141-060		72136	DM5C0100300WV
C127	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (A8)	912-4141-540		72136	DM5C0200300WV
C128	NOT USED				
C129	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (C5)	912-4141-070 B		72136	DM5C0300300WV
C130-C132	CAPACITOR,FXD ELCTLT, 2.2UF, 20%, 25V (B1)	184-9102-220		56289	1990225X0025BB1
C133	CAPACITOR,FXD ELCTLT, 22UF, 20%, 10V (B1)	184-9102-080		56289	1990226X0010CB1
C134-C205	NOT USED				
C206	CAPACITOR, TEST SELECT C206				
	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	CD5CC01000
C206	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	DM5C0200300WV
C206	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 G		93790	CD5CC03000
C207-C210	NOT USED				
C211	CAPACITOR, TEST SELECT C211				
	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	CD5CC01000
C211	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	DM5C0200300WV
C211	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 C		93790	CD5CC03000
C212-C247	NOT USED				
C248	CAPACITOR, TEST SELECT C248				
	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	CD5CC01000
C248	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	DM5C0200300WV
C248	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 C		93790	CD5CC03000
C249	CAPACITOR, TEST SELECT C249				
	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	CD5CC01000
C249	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	DM5C0200300WV
C249	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 C		93790	CD5CC03000
C250	CAPACITOR, TEST SELECT C250				
	CAPACITOR,FXD MICA DIEL, 1PF, PORM 0.5PF, 300V (D1)	912-4141-060 C		93790	CD5CC01000
C250	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D1)	912-4141-540 C		72136	DM5C0200300WV
C250	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V (D1)	912-4141-070 C		93790	CD5CC03000
C251	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (D1)	913-4018-000 C		81349	CK05BX102K
FL1-FL13	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
FL14	FILTER,BP 109.35 MHZ	293-1222-030 A		00136	293-1222-030
FL14	FILTER,BP 109.35 MHZ	293-1330-010 B,D		00136	293-1330-010
FL15, FL16	FILTER,BP 109.35 MHZ	293-1222-050 C			
FL17	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
FL17	NOT USED				

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
FL18	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
FL19, FL20	NOT USED				
FL21	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
FL22-FL32	NOT USED				
FL33-FL36	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
FL37-FL55	NOT USED				
FL56	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
FL57	FILTER,RAD INTR 1750PF	241-5006-010 C		81349	FL38GW1ED3-0001
H1	SCREW,MACH NP BRS, 4-40 X 1/4 (QTY 44)	343-0285-000		72750	P343-0285-000
H2	WASHER,LOCK BRZ, 0.115 ID X 0.202 OD (QTY 48)	310-0396-000		79807	310-0396-000
H3	NUT,SLFLKG,HEX AL, 4-40 (QTY 2)	333-0346-000 A,B		72962	69NH40
H3	NUT,PLAIN,HEX NP BRS, 2-56 (QTY 2)	313-0050-000 C		72750	P313-0050-000
H4	WASHER,FLAT BRS, 0.125 ID X 0.312 OD (QTY 25)	310-0054-000		79807	310-0054-000
H5	SCREW,MACH SST, 4-40 X 3/16 (QTY 3)	342-0043-000		96906	MS51959-12
H6	HEAT SINK,ELEC (QTY 1)	352-9604-010		98978	TXB3-032-037R
H7	NUT,PLAIN,HEX NP BRS, 8-32 (QTY 1)	313-0143-000 C		72750	P313-0143-000
H8	SCREW,MACH NP BRS, 2-56 X 7/16 (QTY 4)	343-0302-000 C		72750	P343-0302-000
H9	TERMINAL,LUG (QTY 1)	304-0014-000 C		77147	4040-2HT
H10	HEATSINK,ELEC (QTY 2)	352-9555-050		98978	TX0522B
H11	SCREW,MACH NP BRS, 2-56 X 3/16 (QTY 9)	343-0298-000		72750	P343-0298-000
H12	WASHER,SPRING CD PL BRZ, 0.088 ID X 0.172 OD (QTY 11)	310-0093-000		96906	MS35338-96
H13	SCREW,MACH NP BRS, 4-40 X 5/16 (QTY 5)	343-0286-000		72750	P343-0286-000
H14	SCREW,MACH SST, 6-32 X 7/16 (QTY 2)	342-0063-000		96906	MS51959-29
H15	RING,RETAINING (QTY 2)	340-0641-000		91314	340-0641-000
H16	SCREW,MACH NP BRS, 4-40 X 3/16 (QTY 1)	343-0284-000		72750	P343-0284-000
H17	TERMINAL,LUG (QTY 3)	304-0015-000		77147	4007-4HT
J1	CONNECTOR,RCPT ELEC	357-7207-030		98291	52-309-3188
J2	NOT USED				
J3	CONNECTOR,RCPT ELEC	357-7207-030		98291	52-309-3188
J4	NOT USED				
J5,J6	CONNECTOR,RCPT ELEC	357-7207-030		98291	52-309-3188
L1-L43	NOT USED				
L44-L47	COIL,RF 220UH	240-2723-060		96906	MS75085-11
L48-L56	NOT USED				
L57	COIL,RF 12UH	240-1581-000		96906	MS14046-5
L58	COIL,RF 4.70UH (B1)	240-2711-210 A		98500	240-2711-210
L59	COIL,RF 120UH	240-2715-390		96906	MS75089-12
L59,L60	COIL,RF 15UH	240-1602-000		96906	MS75101-9
MP1	COVER, NO 1 (QTY 1)	635-4905-001 A,B			
MP1	COVER, NO 1 (QTY 1)	646-7128-001 C			
MP2	COVER, NO 2 (QTY 1)	635-4910-001			
MP3	COVER, NO 3 (QTY 1)	635-4906-001			
MP4	BRACKET, FILTER-NO 1 (QTY 1)	635-9691-001			
MP5	BRACKET, FILTER-NO 2 (QTY 1)	635-9692-001			
MP6	BRACKET, FILTER-NO 4 (QTY 1)	635-9694-001 A,B			
MP6	BRACKET, MOUNTING (QTY 1)	646-7130-001 C			
MP7	PLATE, FILTER (QTY 2)	635-9667-001 A,B			
MP7	PLATE, MOUNTING (QTY 1)	646-7129-001 C			
MP7	PLATE, FILTER (QTY 1)	635-9667-001 C			
MP8	LUG, GROUND (QTY 1)	635-9668-001			
MP9	SPACER (QTY 1)	541-6088-002 C		541-6088-002	
MP10	NUT, HEX-SPECIAL (QTY 2)	646-7131-001 C			
Q1-Q8	NOT USED				
Q9	TRANSISTOR, FET, U322(TEST SELECT)	637-9117-002 A,B,D			
Q10	TRANSISTOR	352-0766-010 A,B,D		95445	2N5109
Q11-Q13	NOT USED				
Q14	TRANSISTOR	352-0766-010		95445	2N5109
Q15-Q205	NOT USED				
Q206	TRANSISTOR,FET	352-1041-010 C		17856	U322
Q207	TRANSISTOR,RF	352-1191-010 C		04713	MRF511
Q208	NOT USED				
Q209	TRANSISTOR, MODIFIED	646-7126-001 C			2N3375
Q210	NOT USED				
R1-R16	NOT USED				
R17	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R18-R138	NOT USED				
R139	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/4W (A11)	745-0722-000 A		81349	RCR07G181KS
R139	RESISTOR, TEST SELECT R139				
R139	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR07G820KS
R139	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R139	RESISTOR,FXD CHPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349	RCR07G151KS
R139	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R140-R232	NOT USED				
R233-R236	RESISTOR,FXD CHPSN, 1K, 10%, 1W	745-3352-000 C		81349	RCR32G102KS
R237	NOT USED				
R238	RESISTOR,FXD CHPSN, 100 OHMS, 5%, 1/8W	745-1863-250 C		81349	RCR05G101JS
R239	RESISTOR,FXD CHPSN, 33 OHMS, 5%, 1/8W (D1)	745-1863-130 C		81349	RCR05G330JS
R239	RESISTOR, 470K	637-3793-001 B			
Z1	RF FILTER BOARD A1	635-0780-002 A,B			
	RF FILTER BOARD A1	635-0780-004 C			

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
CR1,CR2	SEMICONO DEVICE	353-3644-010	A,B	03508	1N4454GE
CR1,CR2	SEMICONO DEVICE	353-3723-010	C	03508	5TB707
CR3	SEMICONO DEVICE	353-3644-010	A,B	03508	1N4454GE
CR4	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
CR5	SEMICONO DEVICE	353-3644-010	A,B	03508	1N4454GE
CR5	SEMICONO DEVICE	922-6119-010	C	28480	1N5767
CR6	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
CR7	SEMICONO DEVICE	353-3644-010	A,B	03508	1N4454GE
CR7	SEMICONO DEVICE	922-6119-010	C	28480	1N5767
CR8-CR10	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
CR11	SEMICONO DEVICE	353-3644-010	A,B	03508	1N4454GE
CR11	SEMICONO DEVICE	922-6119-010	C	28480	1N5767
CR12	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
CR13	SEMICONO DEVICE	353-3644-010	A,B	03508	1N4454GE
CR13	SEMICONO DEVICE	922-6119-010	C	28480	1N5767
CR14	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
CR15-	NOT USED				
CR17					
CR18	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
CR19,	SEMICONO DEVICE (D3)	353-3644-010	C	03508	DA2739SE
CR20					
C1	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 500V	912-2834-000	A,B	81349	CM05FD181J03
C1	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 500V	912-2828-000		81349	CM05FD151J03
C2	CAPACITOR,FXD MICA DIEL, 330PF, 5%, 500V	912-2652-000		81349	CM05FD331J03
C3	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 35V	184-9102-390		56289	1980475X0035DB
C4	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C5	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V	912-4141-070		72136	DM5C0300300WV
C6	CAPACITOR,FXD MICA DIEL, 18PF, PORM 0.5PF, 100V	912-4141-140		72136	DM5C1800100WV
C7	CAPACITOR,FXD MICA DIEL, 200PF, 5%, 50V	912-4141-440	A,B	72136	DM5F201J050WV
C7	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430	C	93790	CD5FY181J0
C8	CAPACITOR,FXD MICA DIEL, 91PF, 5%, 50V	912-4141-360		72136	DM5F910J050WV
C9,C10	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C11-C13	NOT USED				
C14-C17	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C18	CAPACITOR,FXD CER DIEL, 3300PF, PORM10%, 100V	913-3281-170		18796	8131-100C0G332
C19	CAPACITOR,FXD PLSTC DIEL, 0.015UF, 5%, 150V	913-1084-030		56289	LP88A1V153J
C20	CAPACITOR,FXD CER DIEL, 3300PF, PORM10%, 100V	913-3281-170		18796	8131-100C0G332
C21,C22	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C23	CAPACITOR,FXD CER DIEL, 3300PF, PORM10%, 100V	913-3281-170		18796	8131-100C0G332
C24	CAPACITOR,FXD CER DIEL, 1500PF, PORM10%, 100V	913-3281-140		18796	8131-100C0G332
C25	CAPACITOR,FXD CER DIEL, 3300PF, PORM10%, 100V	913-3281-170		18796	8131-100C0G332
C26	NOT USED				
C27	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050	A,B	72136	DM5F101J050WV
C27	CAPACITOR,FXD MICA DIEL, 68PF, 5%, 50V	912-4141-330	C	93790	CD5EY680J0
K1,K2	RELAY,AHT	974-1065-090		01526	35AV1087A2
L1	COIL,RF 220UH	240-2723-060		96906	MS75085-11
L2,L3	COIL,RF	240-2745-010		99800	BP3391
L4	COIL,RF 220UH	240-2524-000		96906	MS90538-20
L5	COIL,RF 1000UH	240-2540-000		96906	MS90539-15
L6,L7	COIL,RF 27UH	240-2040-000		96906	MS75084-17
L8,L9	COIL,RF 1000UH	240-2540-000		96906	MS90539-15
L10	COIL,RF 220UH	240-2524-000		96906	MS90538-20
L11	COIL,RF 3.30UH	240-2715-190		96906	MS75088-7
L12	COIL,RF 3.30UH	240-2715-190	A,B	96906	MS75088-7
L12	COIL,RF 3.90UH	240-2715-200	C	96906	MS75088-8
L13-L20	NOT USED				
L21	COIL,RF 220UH	240-2723-060		96906	MS75085-11
Q1,Q2	TRANSISTOR	352-0661-020		07263	2NC222A
Q3-Q5	TRANSISTOR	352-0551-010		04713	2NE907A
Q6-Q22	NOT USED				
Q23	TRANSISTOR	352-0661-020	C	07263	2NC222A
R1	RESISTOR,FXD CMPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR07G672KS
R2	RESISTOR,FXD CMPSN, 68K, 10%, 1/4W	745-0515-000		81349	RCR07G683KS
R3	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R4	RESISTOR,FXD CMPSN, 2.2K, 10%, 1W (B2)	745-3366-000	A,B	81349	RCR3CG222KS
R5	RESISTOR,FXD CMPSN, 15K, 10%, 1W	745-3301-000		81349	RCR3CG153KS
R6	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR07G470KS
R7	RESISTOR,FXD CMPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR07G820KS
R7	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R8,R9	RESISTOR,FXD CMPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349	RCR07G270KS
R10	RESISTOR,FXD CMPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RCR07G680KS
R11	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R12	RESISTOR,FXD CMPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR07G820KS
R13-R17	NOT USED				
R18	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R19	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS
R20	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R21	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS
R22	RESISTOR,FXD CMPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G332KS
R23	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R24	RESISTOR,FXD CMPSN, 1.2K, 10%, 1/4W	745-0752-000		81349	RCR07G122KS
R25	RESISTOR,FXD CMPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G332KS
R26	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R27	RESISTOR,FXD CMPSN, 1.2K, 10%, 1/4W	745-0752-000		81349	RCR07G122KS
R28	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W (D3)	745-0773-000	C	81349	RCR07G472KS
R29-R137	NOT USED				
R138	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000	A,B	81349	RCR07G472KS
VR1,VR2	SEMICONO DEVICE	353-2714-000		81483	1N753A
FIRST MIXER BOARD A2		635-0782-002	A		



SEE DETAIL G

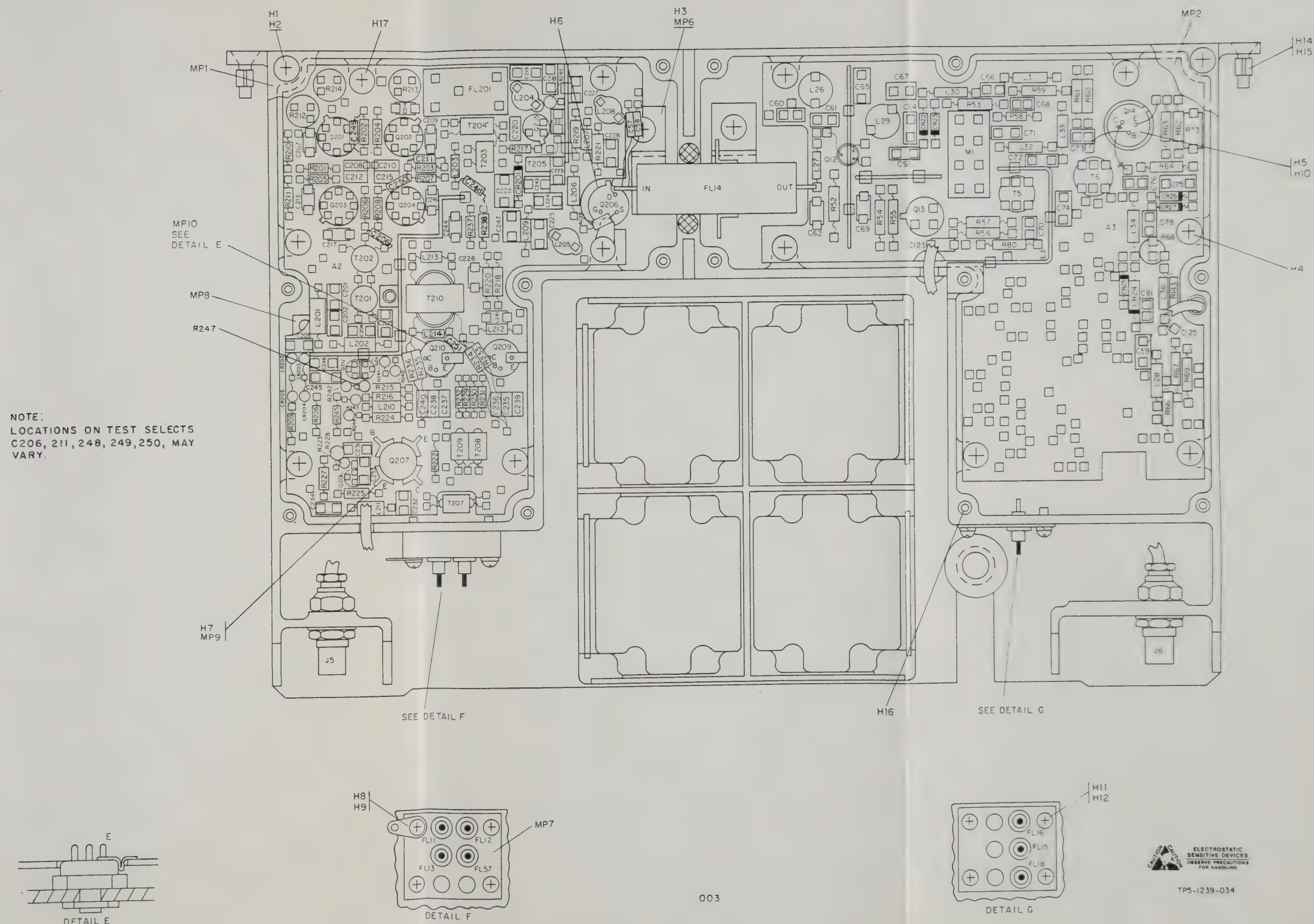


DETAIL G

CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TP5-1239-034

RF Translator, Schematic Diagram
Figure 5 (Sheet 3)



PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	NS M PIER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R47	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/8W	745-2298-000		81349	RC22-040		00136	Z985
R48	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RC			
R49	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RC62-000		96906	MS18130-1
R50	RESISTOR,FXD CHPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349	RC			
R51	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/4W (A5)	745-0701-000		81349	RC15-000		96906	MS75083-05
R51	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RC39-020		02113	115CLWDRY4-STURN
R52-R141	NOT USED							
R142	RESISTOR,FXD CHPSN, 2.2K, 5%, 1/8W (A1)(C4)	745-1863-570		81349	RC39-100		02113	115CLWDRG63-STU
R142	RESISTOR,FXD CHPSN, 1.6K, 5%, 1/8W	745-1863-540		81349	RC		RNS	
R143	NOT USED				028-000		96906	MS75084-05
R144	RESISTOR,FXD CHPSN, 110 OHMS, 5%, 1/8W (A5)	745-1863-260		81349	RC			
R145					39-030		02113	115CLWDR2-STURN
T1	TRANSFORMER,RF	278-0430-160		03550	22		96906	MS75084-05
T2	TRANSFORMER,RF	278-0430-190		03550	2228-000		96906	MS75083-05
T3	TRANSFORMER,RF	278-0431-020		02113	2215-000		96906	MS75083-07
T4	TRANSFORMER,RF	278-0431-010		02113	2217-000		96906	MS75083-09
	FIRST MIXER BOARD A2	635-0782-004 B			019-000		96906	MS75083-06
					016-000		96906	MS75083-07
CR1-CR18	NOT USED							
CR19	SEMICOND DEVICE	922-6119-010		28480	1003-010		91719	HEM955
CR20								
CR21	SEMICOND DEVICE	353-6442-010		04713	1028-001			
C1-C27	NOT USED							
C28	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		93790	CD42-010		17856	U310
C29	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790	CD			
C30	CAPACITOR,FXD MICA DIEL, 12PF, PORM 0.5PF, 300V	912-4141-120		93790	CD		04713	MPS2907A
C31	CAPACITOR,FXD MICA DIEL, 36PF, 5%, 50V	912-4141-240		93790	CD			
C32	CAPACITOR,FXD MICA DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY			
C33	CAPACITOR,FXD MICA DIEL, 240PF, 5%, 50V	912-4141-460		93790	CD01-010		04713	MPS2222A
C34	CAPACITOR,FXD MICA DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY00-010		04713	MPS2907A
C35,C36	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 50V	913-5019-280		81349	CK			
C37	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790	CD63-730		81349	RCR05G103JS
C38	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 50V	913-5019-280		81349	CK			
C39	CAPACITOR,FXD MICA DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY359-000		81349	RCR05G332KS
C40	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790	CD65-000		81349	RCR05G472KS
C41	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY			
C42	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		93790	CD27-100		80294	3329HCT1-103
C43	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY63-730		81349	RCR05G103JS
C44	CAPACITOR,FXD MICA DIEL, 33PF, 2%, 50V	912-4141-210		93790	CD362-000		81349	RCR05G392KS
C45	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK295-000		81349	RCR05G560KS
C46	CAPACITOR,FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		93790	CD731-000		81349	RCR076331KS
					695-000		81349	RCR076330KS
C47	CAPACITOR,FXD MICA DIEL, 330PF, 5%, 50V	912-4141-490		93790	CD701-000		81349	RCR076470KS
C48,C49	CAPACITOR,FXD MICA DIEL, 20PF, PORM 0.5PF, 100V	912-4141-150		93790	CD350-000		81349	RCR05G182KS
					963-490		81349	RCR05G102JS
C50	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY338-000		81349	RCR05G821KS
C51	CAPACITOR,FXD MICA DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY335-000		81349	RCR05G681KS
C52	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK362-000		81349	RCR05G392KS
C53	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY277-000		81349	RCR05G180KS
C54,C55	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK			
C56	CAPACITOR,FXD CER DIEL, 1000PF, 20%, 50V	913-3279-030		16546	CY344-000		81349	RCR05G122KS
C57-C76	NOT USED				963-290		81349	RCR05G151JS
C77	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790	CD050-090		81349	RCR05G150F
C78-C133	NOT USED				356-000		81349	RCR05G272KS
C134	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790	CD			
L1-L13	NOT USED				292-000		81349	RCR05G470KS
L14	COIL,RF 0.22UH	240-2015-000		96906	MS			
L15	COIL,RF 0.27UH	240-2016-000		96906	MS			
L16	COIL,RF 220UH	240-2723-060		96906	MS			
L17,L18	COIL,RF 2.70UH	240-2028-000		96906	MS863-290		81349	RCR05G151JS
L19,L20	COIL,RF 1UH	240-2023-000		96906	MS863-430		81349	RCR05G561JS
L21	NOT USED				963-220		81349	RCR05G750JS
L22,L23	COIL,RF 2.70UH	240-2028-000		96906	MS			
L24	COIL,RF,VAR	242-0439-030		02113	11863-730		81349	RCR05G103JS
					S 863-770		81349	RCR05G153JS
L25	COIL,RF 0.15UH	240-2013-000		96906	MS749-000		81349	RCR076102KS
L26-L39	NOT USED							
L40	COIL,RF 2.70UH	240-2028-000		96906	MS353-000		81349	RCR05G222KS
L41-L68	NOT USED				863-730		81349	RCR05G103JS
L69	COIL,RF 0.15UH	240-2013-000		96906	MS317-000		81349	RCR05G221KS
Q1-Q6	NOT USED							
Q7,Q8	TRANSISTOR, TEST SELECT	637-9117-001			444-030		20462	278-0444-030
Q9,Q10	NOT USED				444-040		20462	278-0444-040
Q11	TRANSISTOR	352-0766-010		95445	2N444-050		20462	278-0444-050
RT1	RESISTOR,THRM 40 OHMS, 10%, 0.5W	714-1725-000		10646	03444-060		20462	278-0444-060
RT2	RESISTOR,THRM 100 OHMS, 10%, 1W	714-1730-000		10646	05444-070		20462	278-0444-070
RI-R29	NOT USED							
R30	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RC439-060		20462	278-0439-060
R31	RESISTOR,VAR 1K, 5%, 3/4W	381-1853-170		81349	RT439-070		20462	278-0439-070
R32	RESISTOR,FXD FILM, 226 OHMS, 1%, 1/8W	705-0965-000		81349	RN			
R33	RESISTOR,FXD FILM, 681 OHMS, 1%, 1/8W	705-0988-000		81349	RN439-050		20462	278-0439-050
R34	RESISTOR,FXD CHPSN, 4.7 OHMS, 5%, 1/4W	745-4382-000		81349	RC			
R35	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RC784-002			
R36	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/8W	745-2323-000		81349	RC			
R37	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RC			
R38	RESISTOR,FXD CHPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349	RC119-010		28480	1N5767
R39	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RC			
R40	RESISTOR,FXD CHPSN, 18 OHMS, 10%, 1/4W	745-0686-000		81349	RC442-010		04713	1N4001
					444-010		03500	1N44546E

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Revised 1 January 1981

PARTS LIST (Cont)				
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE MFR PART NUMBER
R47	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/8W	745-2298-000		81349 RCR05G680K3
R48	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349 RCR07G680K3
R49	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349 RCR07G391K3
R50	RESISTOR,FXD CHPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349 RCR07G270K3
R51	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/4W (A5)	745-0701-000		81349 RCR07G470K3
R51	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349 RCR07G101K3
R52-R141	NOT USED			
R142	RESISTOR,FXD CHPSN, 2.2K, 5%, 1/8W (A1)(C4)	745-1863-570		81349 RCR05G222J3
R142	RESISTOR,FXD CHPSN, 1.6K, 5%, 1/8W	745-1863-540		81349 RCR05G162J5
R143	NOT USED			
R144,	RESISTOR,FXD CHPSN, 110 OHMS, 5%, 1/8W (A5)	745-1863-260		81349 RCR05G111J5
R145				
T1	TRANSFORMER,RF	278-0430-160		03550 22027
T2	TRANSFORMER,RF	278-0430-190		03550 22487
T3	TRANSFORMER,RF	278-0431-020		02113 278-0431-020
T4	TRANSFORMER,RF	278-0431-010		02113 278-0431-010
	FIRST MIXER BOARD A2	635-0782-004 B		
CR1-CR18	NOT USED			
CR19,	SEMICONV DEVICE	922-6119-010		28480 1N5767
CR20				
CR21	SEMICONV DEVICE	353-6442-010		04713 1N4001
C1-C27	NOT USED			
C28	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		93790 CD5EY270J0
C29	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790 CD5FY151J0
C30	CAPACITOR,FXD MICA DIEL, 12PF, PORM 0.5PF, 300V	912-4141-120		93790 CD5CC120D0
C31	CAPACITOR,FXD MICA DIEL, 36PF, 5%, 50V	912-4141-240		93790 CD5EY360J0
C32	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 CY30C104M
C33	CAPACITOR,FXD MICA DIEL, 240PF, 5%, 50V	912-4141-460		93790 CD5FY241J0
C34	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 CY30C104M
C35,C36	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 50V	913-3279-280		81349 CK05BX473K
C37	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790 CD5FY181J0
C38	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 50V	913-3279-280		81349 CK05BX473K
C39	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 CY30C104M
C40	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790 CD5FY181J0
C41	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 CY30C104M
C42	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		93790 CD5EC220D0
C43	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546 CY20C103M
C44	CAPACITOR,FXD MICA DIEL, 33PF, 2%, 50V	912-4141-210		93790 CD5EY330G0
C45	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349 CK05BX102K
C46	CAPACITOR,FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		93790 CD5CC150D0
C47	CAPACITOR,FXD MICA DIEL, 330PF, 5%, 50V	912-4141-490		93790 CD5FY331J0
C48,C49	CAPACITOR,FXD MICA DIEL, 20PF, PORM 0.5PF, 100V	912-4141-150		93790 CD5EA200D0
C50	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546 CY20C103M
C51	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 CY30C104M
C52	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4018-000		81349 CK05BX471K
C53	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 CY30C104M
C54,C55	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349 CK05BX102K
C56	CAPACITOR,FXD CER DIEL, 1000PF, 20%, 50V	913-3279-030		16546 CY10C102M
C57-C76	NOT USED			
C77	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790 CD5FY151J0
C78-C133	NOT USED			
C134	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790 CD5FY151J0
C135	COIL,RF 0.22UH	240-2015-000		96906 MS75083-05
C136	COIL,RF 0.27UH	240-2016-000		96906 MS75083-06
C137,C18	COIL,RF 0.00UH	240-2723-060		96906 MS75085-11
C139,C20	COIL,RF 0.70UH	240-2028-000		96906 MS75084-05
C21	NOT USED	240-2023-000		96906 MS75083-13
C22,C23	COIL,RF 0.70UH	240-2028-000		96906 MS75084-05
C24	COIL,RF,VAR	242-0439-030		02113 115CLWNR2-STURN S
C25				
C26	COIL,RF 0.15UH	240-2013-000		96906 MS75083-03
C27	NOT USED			
C28	COIL,RF 2.70UH	240-2028-000		96906 MS75084-05
C29	NOT USED			
C30	COIL,RF 0.15UH	240-2013-000		96906 MS75083-03
C31	NOT USED			
C32	TRANSISTOR, TEST SELECT	637-9117-001		
C33	NOT USED			
C34	TRANSISTOR	352-0766-010		95445 2N5109
C35	RESISTOR,THRM 40 OHMS, 10%, 0.5W	714-1725-000		10646 0325F5-016
C36	RESISTOR,THRM 100 OHMS, 10%, 1W	714-1730-000		10646 0550F5-256
C37-C39	NOT USED			
C40	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349 RCR07G680K3
C41	RESISTOR,VAR 1K, 5%, 1/4W	745-1853-170		81349 RT24C2M102
C42	RESISTOR,FXD FILM, 226 OHMS, 1%, 1/8W	705-0965-000		81349 RH5D02260F
C43	RESISTOR,FXD FILM, 681 OHMS, 1%, 1/8W	705-0988-000		81349 RH5D06810F
C44	RESISTOR,FXD CHPSN, 4.7 OHMS, 5%, 1/4W	745-4382-000		81349 RCR07G47J5
C45	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349 RCR07G332K5
C46	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/8W	745-2323-000		81349 RCR05G331K5
C47	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349 RCR07G220K5
C48	RESISTOR,FXD CHPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349 RCR07G270K5
C49	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349 RCR07G271K5
C50	RESISTOR,FXD CHPSN, 18 OHMS, 10%, 1/4W	745-0686-000		81349 RCR07G180K3

PARTS LIST (Cont)				
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE MFR PART NUMBER
R41	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349 RCR07G271K3
R42	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349 RCR07G272K3
R43	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349 RCR07G222K3
R44,R45	RESISTOR,FXD CHPSN, 22 OHMS, 5%, 1/8W	745-1863-090		81349 RCR05G220J5
R46	NOT USED			
R47	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/8W	745-2298-000		81349 RCR05G680K3
R48	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349 RCR07G680K3
R49	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349 RCR07G391K3
R50	RESISTOR,FXD CHPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349 RCR07G270K3
R51	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349 RCR07G101K3
R52-R141	NOT USED			
R142	RESISTOR,FXD CHPSN, 1.6K, 5%, 1/8W	745-1863-540		81349 RCR05G162J5
R143	NOT USED			
R144,	RESISTOR,FXD CHPSN, 110 OHMS, 5%, 1/8W	745-1863-260		81349 RCR05G111J5
R145				
T1	TRANSFORMER	278-0430-160		03550 22027
T2	TRANSFORMER	278-0444-020		20462 278-0444-020
T3	TRANSFORMER	278-0431-020		02113 278-0431-020
T4	TRANSFORMER	278-0431-010		02113 278-0431-010
	FIRST MIXER BOARD A2 (ESDS)	642-3587-001		
CR1-	NOT USED			
CR200				
CR201-	SEMICONV DEVICE	922-6119-010		28480 1N5767
CR205				
C1-C200	NOT USED			
C201	CAPACITOR,FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		93790 CD5CC150D0
C202	CAPACITOR,FXD MICA DIEL, 10PF, PORM 0.5PF, 300V	912-4141-020		93790 CD5CC100D0
C203	CAPACITOR,FXD MICA DIEL, 120PF, 5%, 50V	912-4141-380		93790 CD5FY121J0
C204,	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V	912-4141-220		93790 CD5EY330J0
C205				
C206	NOT USED			
C207	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349 CK05BX103K
C208	CAPACITOR,FXD CER CHIP, 330PF, 50V, 5%	351-4068-170		96095 18085A331JA8060
C208	CAPACITOR,CHIP,FXD CER DIEL, 330PF, 5%, 50V (D2)	913-3667-190		04222 18085A331JA8060
C209	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349 CK05BX103K
C210	CAPACITOR,FXD CER CHIP, 330PF, 50V, 5%	351-4068-170		96095 18085A331JA8060
C210	CAPACITOR,CHIP,FXD CER DIEL, 330PF, 5%, 50V (D2)	913-3667-190		04222 18085A331JA8060
C211	NOT USED			
C212	CAPACITOR,FXD, CER CHIP, 330PF, 50V, 5%	351-4068-170		96095 18085A331JA8060
C212	CAPACITOR,CHIP,FXD CER DIEL, 330PF, 5%, 50V (D2)	913-3667-190		04222 18085A331JA8060
C213,	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349 CK05BX103K
C214				
C215	CAPACITOR,FXD, CER CHIP, 330PF, 50V, 5%	351-4068-170		96095 18085A331JA8060
C215	CAPACITOR,CHIP,FXD CER DIEL, 330PF, 5%, 50V (D2)	913-3667-190		04222 18085A331JA8060
C216,	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349 CK05BX103K
C217				
C218	CAPACITOR,FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		93790 CD5CC150D0
C219	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-280		93790 CD5EY470J0
C220	CAPACITOR,FXD, CER CHIP, 330PF, 50V, 5%	351-4068-170		96095 18085A331JA8060
C220	CAPACITOR,CHIP,FXD CER DIEL, 330PF, 5%, 50V (D2)	913-3667-190		04222 18085A331JA8060
C221	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V	912-4141-540		72136 DH5C020D300MV
C222,	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 50V	912-4141-450		93790 CD5FY221J0
C223				
C224	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		93790 CD5EC220D0
C225	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V	912-4141-220		93790 CD5EY330J0
C225	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V (D2)	912-4141-280		93790 CD5EY470J0
C226,	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349 CK05BX103K
C227				
C228	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349 CK05BX102K
C229,	NOT USED			
C230				
C231	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 50V	912-4141-450		93790 CD5FY221J0
C232	CAPACITOR,FXD MICA DIEL, 82PF, 5%, 50V	912-4141-350		93790 CD5EY820J0
C233	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349 CK06BX104K
C234	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349 CK05BX103K
C235-	CAPACITOR,FXD, CER CHIP, 330PF, 50V, 5%	351-4068-170		96095 18085A331JA8060
C240				
C235-	CAPACITOR,CHIP,FXD CER DIEL, 330PF, 5%, 50V (D2)	913-3667-190		04222 18085A331JA8060
C240				
C241	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349 CK05BX103K
C242	NOT USED			
C243	CAPACITOR,FXD MICA DIEL, 330PF, 5%, 50V	912-4141-490		93790 CD5FY331J0
C244	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349 CK05BX103K
C245	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349 CK06BX104K
C246,	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 50V	912-4141-450		93790 CD5FY221J0
C247				
C248	CAPACITOR,FXD MICA DIEL, 2PF, PORM 0.5PF, 300V (D2)	912-4141-540		72136 DH5C020D300MV
FL1-	NOT USED			
FL200				

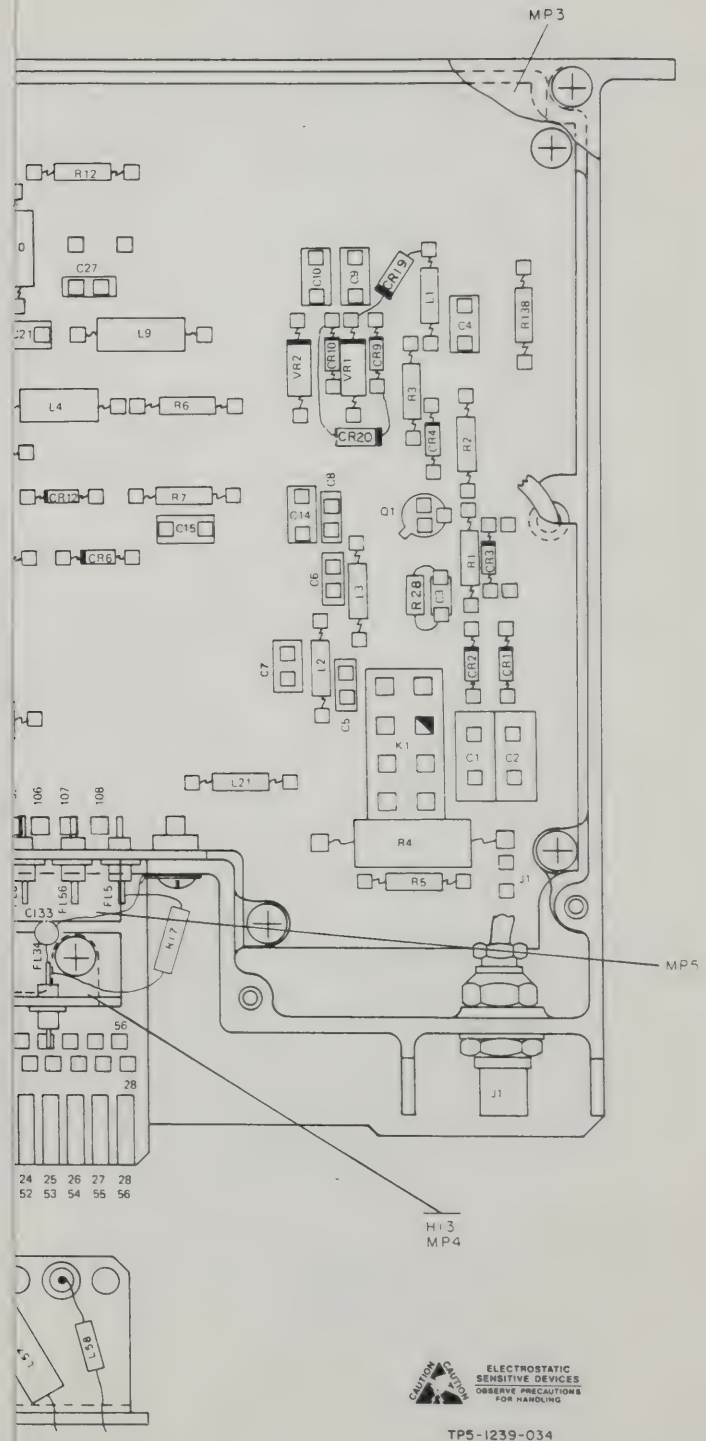
PARTS LIST				
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE MFR PART NUMBER
FL201	FILTER, CRYSTAL	293-1222-040		80136 2Q85
L1-L200	NOT USED			
L201,	COIL,RF 0.15UH	240-1562-000		96906 MS18138-1
L202				
L203	COIL,RF 0.22UH	240-2015-000		96906 MS75083-05
L204	COIL, RF, VAR, 0.106UH-0.164UH	242-0439-020		02113 115CLWNR074-STU S
L205	COIL, RF, VAR, 0.081UH-0.117UH	242-0439-100		02113 115CLWNR063-5 RNS
L206,	COIL,RF 2.70UH	240-2028-000		96906 MS75084-05
L207				
L208	COIL, RF, VAR, 0.059UH-0.074UH	242-0439-030		02113 115CLWNR02-5TU S
L209	COIL,RF 2.70UH	240-2028-000		96906 MS75084-05
L210	COIL,RF 0.22UH	240-2015-000		96906 MS75083-05
L211	COIL,RF 0.33UH	240-2017-000		96906 MS75083-07
L212	COIL,RF 0.47UH	240-2019-000		96906 MS75083-09
L213	COIL,RF 0.27UH	240-2016-000		96906 MS75083-06
L214	COIL,RF 0.33UH (D2)	240-2017-000		96906 MS75083-07
Q1-Q200	NOT USED			
Q201-	TRANSISTOR,DUAL (ESDS)	352-6003-010		91719 MEM955
Q204				
Q201-	TRANSISTOR, MATCHED MEM955 (D2) (ESDS)	646-7028-001		
Q204				
Q205	TRANSISTOR,FET	352-1042-010		17856 U310
Q206,	NOT USED			
Q207				
Q208	TRANSISTOR	352-5500-010		04713 MPS2907A
Q209,	NOT USED			
Q210				
Q211	TRANSISTOR	352-5501-010		04713 MPS2222A
Q212	TRANSISTOR	352-5500-010		04713 MPS2907A
R1-R200	NOT USED			
R201-	RESISTOR,FXD CMPSN, 10K, 5%, 1/8W	745-1863-730		81349 RCR05G103JS
R208				
R209	RESISTOR,FXD CMPSN, 3.3K, 10%, 1/8W	745-2359-000		81349 RCR05G33ZKS
R210,	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W NOT USED	745-2365-000		81349 RCR05G47ZKS
R211				
R212-	RESISTOR,VAR 10K, 10%, 0.5W	382-0027-100		80294 3329HCT1-103
R214				
R215	RESISTOR,FXD CMPSN, 10K, 5%, 1/8W	745-1863-730		81349 RCR05G103JS
R216	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/8W	745-2362-000		81349 RCR05G39ZKS
R217	RESISTOR,FXD CMPSN, 56 OHMS, 10%, 1/8W	745-2295-000		81349 RCR05G560KS
R218	RESISTOR,FXD CMPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349 RCR07G331KS
R219	RESISTOR,FXD CMPSN, 33 OHMS, 10%, 1/4W	745-0695-000		81349 RCR07G330KS
R220	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349 RCR07G470KS
R221	RESISTOR,FXD CMPSN, 1.8K, 10%, 1/8W	745-2350-000		81349 RCR05G18ZKS
R221	RESISTOR,FXD CMPSN, 1K, 5%, 1/8W (D2)	745-1863-490		81349 RCR05G102JS
R222	RESISTOR,FXD CMPSN, 820 OHMS, 10%, 1/8W	745-2338-000		81349 RCR05G821KS
R222	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/8W (D2)	745-2335-000		81349 RCR05G681KS
R223	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/8W	745-2362-000		81349 RCR05G39ZKS
R224,	RESISTOR,FXD CMPSN, 18 OHMS, 10%, 1/8W	745-2277-000		81349 RCR05G180KS
R225				
R226	RESISTOR,FXD CMPSN, 1.2K, 10%, 1/8W	745-2344-000		81349 RCR05G122KS
R227	RESISTOR,FXD CMPSN, 150 OHMS, 5%, 1/8W	745-1863-290		81349 RCR05G151JS
R228	RESISTOR,FXD FILM, 15 OHMS, 1%, 1/8W	705-3600-090		81349 RH55D15R0F
R229,	RESISTOR,FXD CMPSN, 2.7K, 10%, 1/8W	745-2356-000		81349 RCR05G27ZKS
R230				
R231,	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/8W	745-2292-000		81349 RCR05G470KS
R232				
R233-	NOT USED			
R236				
R237	RESISTOR,FXD CMPSN, 150 OHMS, 5%, 1/8W	745-1863-290		81349 RCR05G151JS
R237	RESISTOR,FXD CMPSN, 560 OHMS, 5%, 1/8W (D2)	745-1863-430		81349 RCR05G561JS
R238	RESISTOR,FXD CMPSN, 75 OHMS, 5%, 1/8W (D2)	745-1863-220		81349 RCR05G750JS
R239	NOT USED			
R240	RESISTOR,FXD CMPSN, 10K, 5%, 1/8W	745-1863-730		81349 RCR05G103JS
R241	RESISTOR,FXD CMPSN, 15K, 5%, 1/8W	745-1863-770		81349 RCR05G153JS
R242-	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349 RCR07G102KS
R244				
R245	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/8W	745-2353-000		81349 RCR05G22ZKS
R246	RESISTOR,FXD CMPSN, 10K, 5%, 1/8W	745-1863-730		81349 RCR05G103JS
R247	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/8W (D2)	745-2317-000		81349 RCR05G221KS
T1-T200	NOT USED			
T201	TRANSFORMER,RF	278-0444-030		20462 278-0444-030
T202	TRANSFORMER,RF	278-0444-040		20462 278-0444-040
T203	TRANSFORMER,RF	278-0444-050		20462 278-0444-050
T204	TRANSFORMER,RF	278-0444-060		20462 278-0444-060
T205	TRANSFORMER,RF	278-0444-070		20462 278-0444-070
T206	NOT USED			
T207	TRANSFORMER,RF	278-0439-060		20462 278-0439-060
T208,	TRANSFORMER,RF	278-0439-070		20462 278-0439-070
T209				
T210	TRANSFORMER,RF	278-0439-050		20462 278-0439-050
SECOND MIXER BOARD A3		635-0784-002		
CR1-CR21	NOT USED			
CR22,	SEMICOND DEVICE	922-6119-010		28480 1N5767
CR23				
CR24	SEMICOND DEVICE (A3)	353-6442-010		04713 1N4001
CR25	SEMICOND DEVICE (A3)	383-3644-010		03508 1N4546E

PARTS LIST

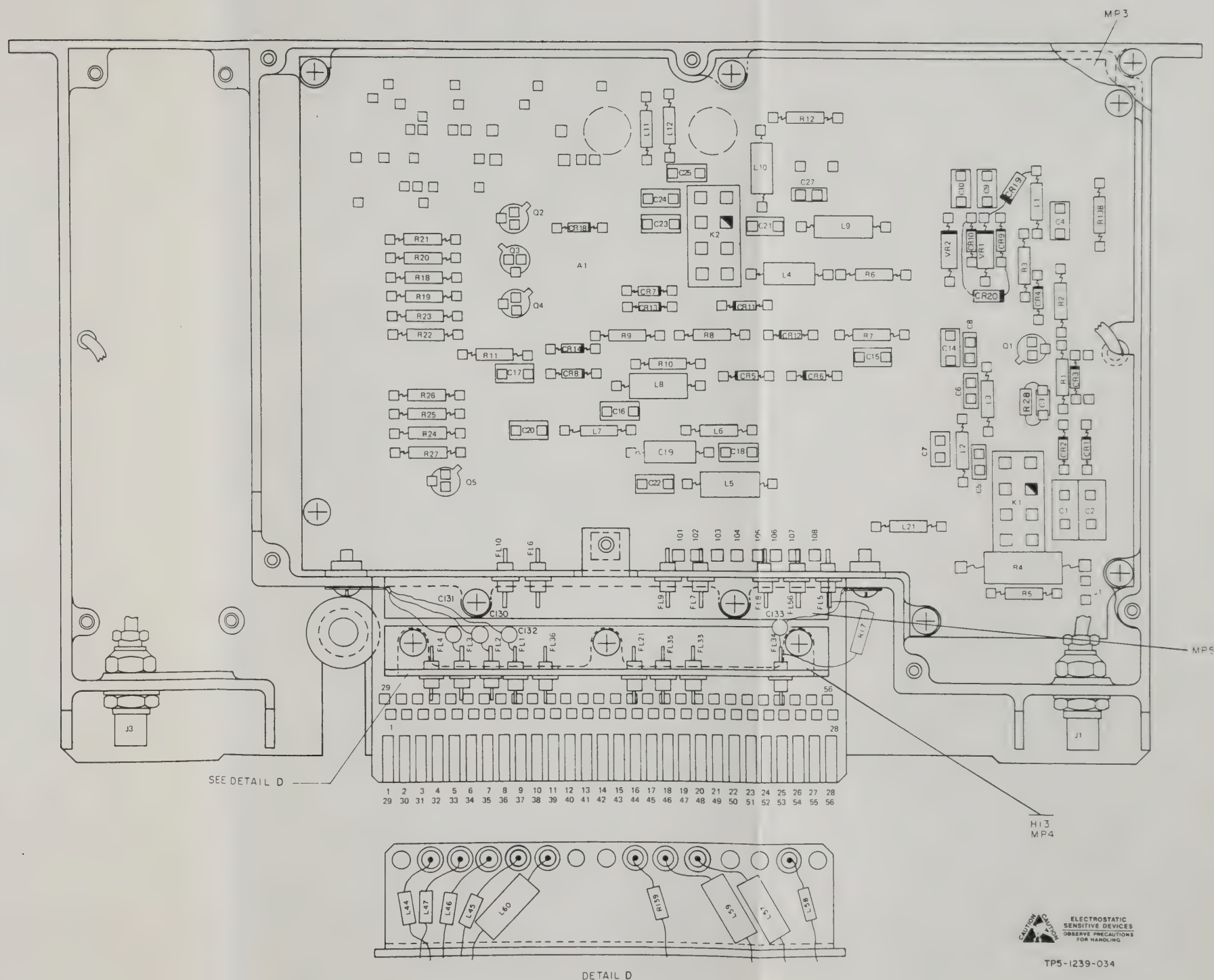
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	REF DES	DESCRIPTION
CR1-CR18	NOT USED				FL201	FILTER, CRYSTAL
CR19,	SEMICONO DEVICE	922-6119-010		81349 RCR076271KS	L1-L200	NOT USED
CR20				28480764-000	L201,	COIL, RF 0.15UH
CR21	SEMICONO DEVICE	353-6442-010		0761-000	L202	
C1-C27				04711863-090	L203	COIL, RF 0.22UH
C28	CAPACITOR, FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		93752298-000	L204	COIL, RF, VAR, 0.106UH-0.164UH
C29	CAPACITOR, FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93750707-000		
C30	CAPACITOR, FXD MICA DIEL, 12PF, PORM 0.5PF, 300V	912-4141-120		93750734-000	L205	COIL, RF, VAR, 0.081UH-0.117UH
C31	CAPACITOR, FXD MICA DIEL, 47PF, 5%, 50V (C1)	912-4141-280		0692-000	L206,	COIL, RF 2.70UH
C31	CAPACITOR, FXD MICA DIEL, 36PF, 5%, 50V	912-4141-240		93750713-000	L207	
C32	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		9375	L208	COIL, RF, VAR, 0.059UH-0.074UH
C33	CAPACITOR, FXD MICA DIEL, 240PF, 5%, 50V	912-4141-460		16541863-540		
C34	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		9375	L209	COIL, RF 2.70UH
C35, C36	CAPACITOR, FXD CER DIEL, 0.047UF, PORM10%, 50V	913-5019-280		16541863-260	L210	COIL, RF 0.33UH
C37	CAPACITOR, FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		8134	L211	COIL, RF 0.47UH
C38	CAPACITOR, FXD CER DIEL, 0.047UF, PORM10%, 50V	913-5019-280		93750430-160	L212	COIL, RF 0.27UH
C39	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		03550 22027	L213	COIL, RF 0.33UH (D2)
C40	CAPACITOR, FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		20462 278-0444-020	Q1-Q200	NOT USED
C41	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		02113 278-0431-020	Q201-	TRANSISTOR, DUAL (ESDS)
C42	CAPACITOR, FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		93750431-010	Q204	
C43	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654	Q201-	TRANSISTOR, MATCHED MEM955 (D2) (E
C44	CAPACITOR, FXD MICA DIEL, 33PF, 2%, 50V	912-4141-210		9375	Q204	
C45	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81346119-010	Q205	TRANSISTOR, FET
C46	CAPACITOR, FXD MICA DIEL, 5PF, PORM 0.5PF, 300V (A10)	912-4141-010		9375	Q206,	NOT USED
C46	CAPACITOR, FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		937594141-130	Q207	
C47	CAPACITOR, FXD MICA DIEL, 51PF, 5%, 50V (A10)	912-4141-300			Q208	TRANSISTOR
C47	CAPACITOR, FXD MICA DIEL, 330PF, 5%, 50V	912-4141-490		937594141-020	Q209,	NOT USED
C48, C49	CAPACITOR, FXD MICA DIEL, 18PF, PORM 0.5PF, 100V (A5)	912-4141-140		9375	Q210	
C48, C49	CAPACITOR, FXD MICA DIEL, 20PF, PORM 0.5PF, 100V	912-4141-150		937594141-380	Q211	TRANSISTOR
C50	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		937594141-220	Q212	TRANSISTOR
C51	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		937594141-280	R1-R200	NOT USED
C52	CAPACITOR, FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		9375	R201-	RESISTOR, FXD CMPSN, 10K, 5%, 1/8W
C53	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	R208	
C54, C55	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81345019-200	R209	RESISTOR, FXD CMPSN, 3.3K, 10%, 1/8W
C56	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V (C1)	913-3279-110		96095 18085A331JA8060	R210,	RESISTOR, FXD CMPSN, 4.7K, 10%, 1/8W
C56	CAPACITOR, FXD CER DIEL, 1000PF, 20%, 50V	913-3279-030		81343667-190	R211	
C57-C76	NOT USED			04222 18085A331JA8060	R212-	RESISTOR, VAR 10K, 10%, 0.5W
C77	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V (A5)	913-4018-000		1654	R214	
C77	CAPACITOR, FXD MICA DIEL, 47PF, 5%, 50V	912-4141-280		81345019-200	R215	RESISTOR, FXD CMPSN, 10K, 5%, 1/8W
C78-C133	NOT USED			96095 18085A331JA8060	R216	RESISTOR, FXD CMPSN, 3.9K, 10%, 1/8W
C134	CAPACITOR, FXD MICA DIEL, 150PF, 5%, 50V (C7)(C8)	912-4141-400		04222 18085A331JA8060	R217	RESISTOR, FXD CMPSN, 56 OHMS, 10%,
L1-L13	NOT USED			937594068-170	R218	RESISTOR, FXD CMPSN, 330 OHMS, 10%,
L14	COIL, RF 0.22UH	240-2015-000		937594068-170	R219	RESISTOR, FXD CMPSN, 33 OHMS, 10%,
L15	COIL, RF 0.27UH	240-2016-000		96095 18085A331JA8060	R220	RESISTOR, FXD CMPSN, 47 OHMS, 10%,
L16	COIL, RF 220UH	240-2723-060		04222 18085A331JA8060	R221	RESISTOR, FXD CMPSN, 1.8K, 10%, 1/8W
L17, L18	COIL, RF 2.70UH	240-2028-000		96095019-200	R222	RESISTOR, FXD CMPSN, 1K, 5%, 1/8W
L19, L20	COIL, RF 2.70UH (A5)	240-2028-000		9609	R223	RESISTOR, FXD CMPSN, 820 OHMS, 10%,
L19, L20	COIL, RF 1UH	240-2028-000		96094141-130	R224	RESISTOR, FXD CMPSN, 680 OHMS, 10%,
L21	NOT USED				R225	RESISTOR, FXD CMPSN, 3.9K, 10%, 1/8W
L22, L23	COIL, RF 2.70UH	240-2028-000		93790 CD5CC15000	R226	RESISTOR, FXD CMPSN, 1.2K, 10%, 1/8W
L24	COIL, RF, VAR	242-0439-030		96095 18085A331JA8060	R227	RESISTOR, FXD CMPSN, 150 OHMS, 5%,
L25	COIL, RF 0.15UH	240-2013-000		04222 18085A331JA8060	R228	RESISTOR, FXD FILM, 15 OHMS, 1%, 1/8W
L26-L39	NOT USED			96095019-200	R229,	RESISTOR, FXD CMPSN, 2.7K, 10%, 1/8W
L40	COIL, RF 2.70UH	240-2028-000		96094141-450	R230	
L41-L68	NOT USED			4141-540	R231,	RESISTOR, FXD CMPSN, 47 OHMS, 10%,
L69	COIL, RF 0.15UH (A5)	240-2013-000		96094141-030	R232	
Q1-Q6	NOT USED			93790 CD5EY221J0	R233-	NOT USED
Q7, Q8	TRANSISTOR, FET U322 (MATCHED SET)	637-9117-001		93790 CD5EY330J0	R236	
Q9, Q10	NOT USED			93790 CD5EY470J0	R237	RESISTOR, FXD CMPSN, 150 OHMS, 5%,
Q11	TRANSISTOR	352-0766-010		81349 CK05BX103K	R238	RESISTOR, FXD CMPSN, 75 OHMS, 5%,
RT1	RESISTOR, THRM 40 OHMS, 10%, 0.5W	714-1725-000		1064	R239	NOT USED
RT2	RESISTOR, THRM 100 OHMS, 10%, 1W	714-1730-000		10644018-000	R240	RESISTOR, FXD CMPSN, 10K, 5%, 1/8W
R1-R29	NOT USED			81349 CK05BX102K	R241	RESISTOR, FXD CMPSN, 15K, 5%, 1/8W
R30	RESISTOR, FXD CMPSN, 68 OHMS, 10%, 1/4W	745-0707-000			R242-	RESISTOR, FXD CMPSN, 1K, 10%, 1/4W
R31	RESISTOR, VAR 1K, 5%, 3/4W	381-1853-170		8134	R244	
R32	RESISTOR, FXD FILM, 226 OHMS, 1%, 1/8W	705-0965-000		81344141-450	R245	RESISTOR, FXD CMPSN, 2.2K, 10%, 1/8W
R33	RESISTOR, FXD FILM, 681 OHMS, 1%, 1/8W	705-0988-000		81344141-350	R246	RESISTOR, FXD CMPSN, 10K, 5%, 1/8W
R34	RESISTOR, FXD CMPSN, 4.7 OHMS, 5%, 1/4W	745-4382-000		81345019-440	R247	RESISTOR, FXD CMPSN, 220 OHMS, 10%,
R35	RESISTOR, FXD CMPSN, 3.3K, 10%, 1/4W	745-0767-000		81345019-200	T1-T200	NOT USED
R36	RESISTOR, FXD CMPSN, 330 OHMS, 10%, 1/8W	745-2323-000		96095 18085A331JA8060	T201	TRANSFORMER, RF
R37	RESISTOR, FXD CMPSN, 270 OHMS, 10%, 1/4W (C2)	745-0728-000			T202	TRANSFORMER, RF
R37	RESISTOR, FXD CMPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81343667-190	T203	TRANSFORMER, RF
R38	RESISTOR, FXD CMPSN, 27 OHMS, 10%, 1/4W	745-0692-000		8134	T204	TRANSFORMER, RF
R39	RESISTOR, FXD CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81345019-200	T205	TRANSFORMER, RF
R40	RESISTOR, FXD CMPSN, 18 OHMS, 10%, 1/4W	745-0686-000		8134	T206	NOT USED
R41	RESISTOR, FXD CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81344141-490	T207	TRANSFORMER, RF
R42	RESISTOR, FXD CMPSN, 2.7K, 10%, 1/4W	745-0764-000		93790 CD5FY331J0	T208	TRANSFORMER, RF
R43	RESISTOR, FXD CMPSN, 1.5K, 10%, 1/4W (C2)	745-0755-000		81345019-200	T209	
R43	RESISTOR, FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349 CK06BX104K	T210	TRANSFORMER, RF
R44, R45	RESISTOR, FXD CMPSN, 18 OHMS, 10%, 1/8W (A7)	745-2277-000		93790 CD5FY221J0		
R44, R45	RESISTOR, FXD CMPSN, 22 OHMS, 5%, 1/8W	745-1863-090		8134		
R46	NOT USED			81344141-540		
R47	RESISTOR, FXD CMPSN, 82 OHMS, 10%, 1/8W (A5)	745-2301-000		8134		
					CR1-CR21	NOT USED
					CR22,	SEMICONO DEVICE
					CR23	
					CR24	SEMICONO DEVICE (A3)
					CR25	SEMICONO DEVICE (A3)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
CR1-CR18	NOT USED				
CR19,	SEMICONO DEVICE	922-6119-010		28480	1N5767
CR20					
CR21	SEMICONO DEVICE	353-6442-010		04713	1N4001
C1-C27					
C28	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		93790	CD5EY270J0
C29	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790	CD5FY151J0
C30	CAPACITOR,FXD MICA DIEL, 12PF, PORM 0.5PF, 300V	912-4141-120		93790	CD5CC12000
C31	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V (C1)	912-4141-280		93790	CD5EY470J0
C31	CAPACITOR,FXD MICA DIEL, 36PF, 5%, 50V	912-4141-240		93790	CD5EY360J0
C32	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C33	CAPACITOR,FXD MICA DIEL, 240PF, 5%, 50V	912-4141-460		93790	CD5FY241J0
C34	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C35,C36	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 50V	913-5019-280		81349	CK05BX473K
C37	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790	CD5FY181J0
C38	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 50V	913-5019-280		81349	CK05BX473K
C39	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C40	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790	CD5FY181J0
C41	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C42	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		93790	CD5EC22000
C43	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C44	CAPACITOR,FXD MICA DIEL, 33PF, 2%, 50V	912-4141-210		93790	CD5EY330G0
C45	CAPACITOR,FXD MICA DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C46	CAPACITOR,FXD MICA DIEL, 5PF, PORM 0.5PF, 300V (A10)	912-4141-010		93790	CD5CC05000
C46	CAPACITOR,FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		93790	CD5CC15000
C47	CAPACITOR,FXD MICA DIEL, 51PF, 5%, 50V (A10)	912-4141-300		93790	CD5EY510J0
C47	CAPACITOR,FXD MICA DIEL, 330PF, 5%, 50V	912-4141-490		93790	CD5FY331J0
C48,C49	CAPACITOR,FXD MICA DIEL, 18PF, PORM 0.5PF, 100V (A5)	912-4141-140		93790	CD5CA18000
C48,C49	CAPACITOR,FXD MICA DIEL, 20PF, PORM 0.5PF, 100V	912-4141-150		93790	CD5EA20000
C50	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C51	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C52	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C53	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C54,C55	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C56	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V (C1)	913-3279-110		16546	CY20C103M
C56	CAPACITOR,FXD CER DIEL, 1000PF, 20%, 50V	913-3279-030		16546	CY10C102M
C57-C76	NOT USED				
C77	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (A5)	913-4018-000		81349	CK05BX102K
C77	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 50V	912-4141-280		93790	CD5EY470J0
C78-C133	NOT USED				
C134	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V (C71)(C8)	912-4141-400		93790	CD5FY151J0
L1-L13	NOT USED				
L14	COIL,RF 0.22UH	240-2015-000		96906	MS75083-05
L15	COIL,RF 0.27UH	240-2016-000		96906	MS75083-06
L16	COIL,RF 220UH	240-2723-060		96906	MS75085-11
L17,L18	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L19,L20	COIL,RF 2.70UH (A5)	240-2028-000		96906	MS75084-05
L21	NOT USED	240-2023-000		96906	MS75083-13
L22,L23	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L24	COIL,RF,VAP	242-0439-030		02113	115CLWNR2-5TURN S
L25	COIL,RF 0.15UH	240-2013-000		96906	MS75083-03
L26-L39	NOT USED				
L40	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L41-L68	NOT USED				
L69	COIL,RF 0.15UH (A5)	240-2013-000		96906	MS75083-03
Q1-Q6	NOT USED				
Q7,Q8	TRANSISTOR, FET U322 (MATCHED SET)	637-9117-001			
Q9,Q10	NOT USED				
Q11	TRANSISTOR	352-0766-010		95445	2N5109
RT1	RESISTOR,THRM 40 OHMS, 10%, 0.5W	714-1725-000		10646	0325F5-016
RT2	RESISTOR,THRM 100 OHMS, 10%, 1W	714-1730-000		10646	0550F5-256
R1-R29	NOT USED				
R30	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RCR07G680KS
R31	RESISTOR,VAR 1K, 5%, 3/4W	381-1853-170		81349	RT24C2W102
R32	RESISTOR,FXD FILM, 226 OHMS, 1%, 1/8W	705-0965-000		81349	RN55D2260F
R33	RESISTOR,FXD FILM, 681 OHMS, 1%, 1/8W	705-0988-000		81349	RN55D6810F
R34	RESISTOR,FXD CHPSN, 4.7 OHMS, 5%, 1/4W	745-4382-000		81349	RCR07G4R7JS
R35	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G33ZKS
R36	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/8W	745-2323-000		81349	RCR05G331KS
R37	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W (C2)	745-0728-000		81349	RCR07G271KS
R38	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R39	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0692-000		81349	RCR07G270KS
R40	RESISTOR,FXD CHPSN, 18 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R41	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0686-000		81349	RCR07G180KS
R42	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R43	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR07G272KS
R44,R45	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0692-000		81349	RCR07G470KS
R46	NOT USED				
R47	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/8W	745-0707-000		81349	RCR07G680KS
R48	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RCR07G680KS
R49	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR07G391KS
R50	RESISTOR,FXD CHPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349	RCR07G270KS
R51	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/4W (A5)	745-0701-000		81349	RCR07G470KS
R52-R141	NOT USED				
R142	RESISTOR,FXD CHPSN, 2.2K, 5%, 1/8W (A1)(C4)	745-1863-570		81349	RCR05G222JS
R143	RESISTOR,FXD CHPSN, 1.6K, 5%, 1/8W	745-1863-540		81349	RCR05G162JS
R144,	RESISTOR,FXD CHPSN, 110 OHMS, 5%, 1/8W (A5)	745-1863-260		81349	RCR05G111JS
R145	NOT USED				
T1	TRANSFORMER,RF	278-0430-160		03550	22027
T2	TRANSFORMER,RF	278-0430-190		03550	22487
T3	TRANSFORMER,RF	278-0431-020		02113	278-0431-020
T4	TRANSFORMER,RF	278-0431-010		02113	278-0431-010
CR1-CR18	NOT USED				
CR19,	SEMICONO DEVICE	922-6119-010		28480	1N5767
CR20					
CR21	SEMICONO DEVICE	353-6442-010		04713	1N4001
C1-C27	NOT USED				
C28	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		93790	CD5EY270J0
C29	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790	CD5FY151J0
C30	CAPACITOR,FXD MICA DIEL, 12PF, PORM 0.5PF, 300V	912-4141-120		93790	CD5CC12000
C31	CAPACITOR,FXD MICA DIEL, 36PF, 5%, 50V	912-4141-240		93790	CD5EY360J0
C32	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C33	CAPACITOR,FXD MICA DIEL, 240PF, 5%, 50V	912-4141-460		93790	CD5FY241J0
C34	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C35,C36	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 50V	913-5019-280		81349	CK05BX473K
C37	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790	CD5FY181J0
C38	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 50V	913-5019-280		81349	CK05BX473K
C39	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C40	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790	CD5FY181J0
C41	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C42	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V	912-4141-030		93790	CD5EC22000
C43	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C44	CAPACITOR,FXD MICA DIEL, 33PF, 2%, 50V	912-4141-210		93790	CD5EY330G0
C45	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C46	CAPACITOR,FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		93790	CD5CC15000
C47	CAPACITOR,FXD MICA DIEL, 330PF, 5%, 50V	912-4141-490		93790	CD5FY331J0
C48,C49	CAPACITOR,FXD MICA DIEL, 20PF, PORM 0.5PF, 100V	912-4141-150		93790	CD5EA20000
C50	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C51	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C52	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C53	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C54,C55	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C56	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-030		16546	CY10C102M
C57-C76	NOT USED				
C77	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790	CD5FY151J0
C78-C133	NOT USED				
C134	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790	CD5FY151J0
L1-L13	NOT USED				
L14	COIL,RF 0.22UH	240-2015-000		96906	MS75083-05
L15	COIL,RF 0.27UH	240-2016-000		96906	MS75083-06
L16	COIL,RF 220UH	240-2723-060		96906	MS75085-11
L17,L18	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L19,L20	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L21	NOT USED	240-2023-000		96906	MS75083-13
L22,L23	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L24	COIL,RF,VAP	242-0439-030		02113	115CLWNR2-5TURN S
L25	COIL,RF 0.15UH	240-2013-000		96906	MS75083-03
L26-L39	NOT USED				
L40	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L41-L68	NOT USED				
L69	COIL,RF 0.15UH (A5)	240-2013-000		96906	MS75083-03
Q1-Q6	NOT USED				
Q7,Q8	TRANSISTOR, FET U322 (MATCHED SET)	637-9117-001			
Q9,Q10	NOT USED				
Q11	TRANSISTOR	352-0766-010		95445	2N5109
RT1	RESISTOR,THRM 40 OHMS, 10%, 0.5W	714-1725-000		10646	0325F5-016
RT2	RESISTOR,THRM 100 OHMS, 10%, 1W	714-1730-000		10646	0550F5-256
R1-R29	NOT USED				
R30	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RCR07G680KS
R31	RESISTOR,VAR 1K, 5%, 3/4W	381-1853-170		81349	RT24C2W102
R32	RESISTOR,FXD FILM, 226 OHMS, 1%, 1/8W	705-0965-000		81349	RN55D2260F
R33	RESISTOR,FXD FILM, 681 OHMS, 1%, 1/8W	705-0988-000		81349	RN55D6810F
R34	RESISTOR,FXD CHPSN, 4.7 OHMS, 5%, 1/4W	745-4382-000		81349	RCR07G4R7JS
R35	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G33ZKS
R36	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/8W	745-2323-000		81349	RCR05G331KS
R37	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W (C2)	745-0728-000		81349	RCR07G271KS
R38	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R39	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0692-000		81349	RCR07G270KS
R40	RESISTOR,FXD CHPSN, 18 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R41	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0686-000		81349	RCR07G180KS
R42	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R43	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR07G272KS
R44,R45	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0692-000		81349	RCR07G470KS
R46	NOT USED				



RF Translator, Schematic Diagram
Figure 5 (Sheet 5)



RF Translator, Schematic Diagram
Figure 5 (Sheet 5)

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
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Note

First mixer board A2 635-0782-002 has used three configurations of baseboard 600-1993-716. These baseboard configurations are identified only by the CI stamped following the baseboard number. Each baseboard may contain a different component layout and/or different printed circuits.

- a. Initial configuration 600-1993-716 CI 77116
- b. Revised configuration 600-1993-716 CI 77266
- c. Current configuration 600-1993-716 CI 77486

Changes to configurations a and b were made only to update cards in factory stock to the current configuration at the time of the revision.

FIRST MIXER BOARD A2 635-0782-002
BASEBOARD 600-1993-716 CI 77116
MODIFICATION HISTORY

Note

Differences between 600-1993-716 CI 77116 before REV K and initial instruction book schematic/parts list are as follows:

C29 was 180 pF. L14 was 0.27 μ H.
C31 was 56 pF. R47 was 47 Ω .

None	Changed: C29 from 180 pF to 150 pF. C31 from 56 pF to 36 pF. L14 from 0.27 μ H to 0.22 μ H.	REV K and above
A1	Added R142, 2200 Ω .	REV K and above
A5	Added: R144, 110 Ω . R145, 110 Ω . Changed: C48 from 18 to 20 pF. C49 from 18 to 20 pF. C77 from 1000 pF to 47 pF. L19 from 2.7 μ H to 1.0 μ H. L20 from 2.7 μ H to 1.0 μ H. R51 from 47 Ω to 100 Ω .	REV K and above
A7	Changed: R44 from 18 Ω to 22 Ω . R45 from 18 Ω to 22 Ω .	REV K and above
A10	Changed: C46 from 5 pF to 15 pF. C47 from 51 pF to 330 pF.	REV K and above

FIRST MIXER BOARD A2 635-0782-002
BASEBOARD 600-1993-716 CI 77266
MODIFICATION HISTORY

Note

600-1993-716 CI 77266 and initial instruction book schematic/parts list are compatible.

A1	Added R142, 2200 Ω .	REV E and above
A5	Added: L69, 0.15 μ H. R144, 110 Ω . R145, 110 Ω . Changed: C48 from 18 pF to 20 pF. C49 from 18 pF to 20 pF. C77 from 1000 pF to 47 pF. L19 from 2.7 μ H to 1.0 μ H. L20 from 2.7 μ H to 1.0 μ H.	REV F and above

MODIFICATION HISTORY (Cont)

REV REVISION AND IDEANGE	EFFECTIVITY
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Note

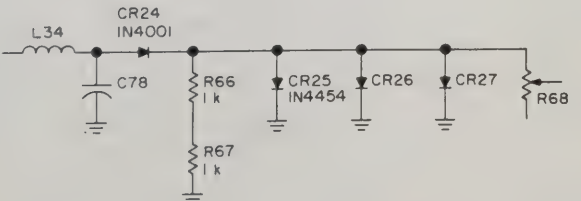
A7	637-1767-XXX REV P has been included in all	
A16	Ω to 1600 Ω .	635-0782-002. REV T and above
C1		637-1767-002 only, REV R and above
C2		
C4	from 277-0405-010 to 277- (automatic change).	635-0784-002. REV P and above
		635-0782-002/ -004, REV AA and above
	and A2C40. 50 pF from across T2-4 and	635-0782-002/ -004, REV AB and above
	from 913-3279-180 to 913- (automatic change).	635-0784-002. REV R and above

Note

	637-1767-XXX REV LL (except C5) has been -003 rf translators.	
A4	capacitors from 2 μ F C249, and C250. 1 μ F. 68 pF to 47 pF and 68 pF. 100 Ω to 33 Ω . A2C210, A2C212, A2C215, A2C240 from 351-4068-170 (no schematic change). from 33 pF to 47 pF. 33 μ H. -A2Q204 from 352-6003-010 (no schematic change). 0 Ω to 1000 Ω . 0 Ω to 680 Ω . 0 Ω to 560 Ω . 75 Ω , from in parallel 20 Ω . and A1CR20, 1N4454	637-1767-003. REV Y and above
A2		642-3587-001. REV B and above
A3		
A4	00 Ω	635-0780-004. REV R and above

Diagram
(6)

Revised 1 January 1981

MODIFICATION HISTORY			MODIFICATION HISTORY (Cont)			MODIFICATION HISTORY (Cont)			MODIFICATION HISTORY (Cont)		
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY	REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY	REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY	REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
Note First mixer board A2 635-0782-002 has used three configurations of base-board 600-1993-716. These baseboard configurations are identified only by the CI stamped following the baseboard number. Each baseboard may contain a different component layout and/or different printed circuits. a. Initial configuration 600-1993-716 CI 77116 b. Revised configuration 600-1993-716 CI 77266 c. Current configuration 600-1993-716 CI 77486 Changes to configurations a and b were made only to update cards in factory stock to the current configuration at the time of the revision. FIRST MIXER BOARD A2 635-0782-002 BASEBOARD 600-1993-716 CI 77116 MODIFICATION HISTORY Note Differences between 600-1993-716 CI 77116 before REV K and initial instruction book schematic/parts list are as follows: C29 was 180 pF. L14 was 0.27 μH. C31 was 56 pF. R47 was 47 Ω. None Changed: C29 from 180 pF to 150 pF. C31 from 56 pF to 36 pF. L14 from 0.27 μH to 0.22 μH. A1 Added R142,2200 Ω. A5 Added: R144, 110 Ω. R145, 110 Ω. Changed: C48 from 18 to 20 pF. C49 from 18 to 20 pF. C77 from 1000 pF to 47 pF L19 from 2.7 μH to 1.0 μH. L20 from 2.7 μH to 1.0 μH. R51 from 47 Ω to 100 Ω. A7 Changed: R44 from 18 Ω to 22 Ω. R45 from 18 Ω to 22 Ω. A10 Changed: C46 from 5 pF to 15 pF. C47 from 51 pF to 330 pF. FIRST MIXER BOARD A2 635-0782-002 BASEBOARD 600-1993-716 CI 77266 MODIFICATION HISTORY Note 600-1993-716 CI 77266 and initial instruction book schematic/parts list are compatible. A1 Added R142, 2200 Ω. A5 Added: L69, 0.15 μH. R144, 110 Ω. R145, 110 Ω. Changed: C48 from 18 pF to 20 pF. C49 from 18 pF to 20 pF. C77 from 1000 pF to 47 pF. L19 from 2.7 μH to 1.0 μH. L20 from 2.7 μH to 1.0 μH. REV K and above REV K and above REV K and above REV E and above REV F and above			Note Second mixer board A3 635-0784-002 has used two configurations of baseboard 600-1993-717. These baseboard configurations are identified only by the CI stamped following the baseboard number. Each baseboard may contain a different component layout and/or different printed circuits. a. Initial configuration 600-1993-717 CI 77116 (635-0784-002 through REV D). b. Current configuration 600-1993-717 CI 77486. Changes to configuration a (after REV D) were made only to update cards in factory stock to the current configuration at the time of the revision. SECOND MIXER BOARD A3 635-0784-002 BASEBOARD 600-1993-717 CI 77116 MODIFICATION HISTORY (AFTER REV D) A4 Changed A3L34 from 0.33 μH to 0.27 μH. Note All changes to 635-0782-002 shown in the remainder of this modification history are for the current configuration baseboard 600-1993-716 CI 77486. A1 Added A2R142, 2200 Ω. A2 Added C126, test select of 2 pF to 6 pF. A3 Deleted A3CR24, 1N4001; A3CR25, 1N4454; A3R66, 1 kΩ; and A3R67, 1 kΩ (circuit was as shown below).  A4 Deleted A3L36, 220 μH (replaced with A3R143). Added A3C125, 4700 pF. Added A3R143, 22 Ω. REV H and above 635-0782-002, REV G and above 637-1767-001, REV C and above 635-0784-002, REV C and above 635-0780-002, REV H and above 635-0782-002, REV R and above 635-0784-002, REV M and above 637-1767-001, REV K and above 635-0780-002, REV H and above 635-0782-002, REV R and above 635-0784-002, REV M and above 637-1767-001, REV P and, above			Note Changed: A3C61 from 33 pF to 27 pF. A3C73 from 0.01 μF to 0.1 μF. A3L34 from 0.39 μH to 0.33 μH. A3R80 from 82 Ω to 68 Ω. A5 Added A2L69, 0.15 μH. Added A2R144, 110 Ω. Added A2R145, 110 Ω. Changed: A2C48 from 18 pF to 20 pF. A2C49 from 18 pF to 20 pF. A2C77 from 1000 pF to 47 pF. A2L19 from 2.7 μH to 1.0 μH. A2L20 from 2.7 μH to 1.0 μH. A2R47 from 82 Ω to 68 Ω. A2R51 from 47 Ω to 100 Ω. A6 Changed A3C65 from 1000 pF to 220 pF. None Changed second mixer A3 635-0784-002 baseboard configuration from 600-1993-717 CI 77116 to 600-1993-717 CI 77486. Note All changes to 635-0784-002 shown in the remainder of this modification history are for the current configuration baseboard 600-1993-717 CI 77486. A7 Changed: A2R44 from 18 Ω to 22 Ω. A2R45 from 18 Ω to 22 Ω. A11 Changed R139 from 180 Ω to test select of 82 Ω to 220 Ω. A8 Added C127, test select of 1 pF or 2 pF. A9 Changed A3L34 from 0.33 μH to 0.27 μH. A10 Changed: A2C46 from 5 pF to 15 pF. A2C47 from 51 pF to 330 pF. C1 Changed: A2C31 from 47 pF to 36 pF. A2C56 from 0.01 μF to 1400 pF. B1 Added C130, 2.2 μF electrolytic. Added C131, 2.2 μF electrolytic. Added C132, 2.2 μF electrolytic. Added C133, 22 μF electrolytic. Changed L58 from 4.7 μH to 120 μH. B2 Changed A1R4 from 2200 Ω to 15 kΩ. C2 Changed: A2R37 from 270 Ω to 220 Ω. A2R43 from 1500 Ω to 2200 Ω. C3 Changed L34 from 0.27 μH to 0.33 μH. B3 Changed: C57 from 56 pF to 68 pF. C58 from 56 pF to 47 pF. 635-0782-002, REV J and above 637-1767-001, REV F and above 637-1767-001, REV H and above 635-0784-002, REV G and above 635-0782-002, REV L and above 635-0782-002, REV M and above 637-1767-001, REV K and above 635-0780-002, REV H and above 635-0782-002, REV R and above 635-0784-002, REV M and above 637-1767-001, REV P and, above			Note Modification history through 637-1767-XXX REV P has been included in all 637-1767-002 rf translators. C4 Changed: A2R142 from 2200 Ω to 1600 Ω. C5 Added: C129, 3 pF. Z1, 637-3793-001 C6 Changed A3M1 from 277-0405-010 to 277-0405-020 (no schematic change). C7 Added: A2C134, 150 pF. C8 Relocated A2C37 and A2C40. Deleted A2C134, 150 pF from across T2-4 and T2-1. C9 Changed A3C73 from 913-3279-180 to 913-3279-200 (no schematic change). Note Modification history through 637-1767-XXX REV LL (except C5) has been incorporated in all 637-1767-003 rf translators. D1 Changed following capacitors from 2 μF to test select: C206, C211, C248, C249, and C250. Added C251, 0.001 μF. Changed C57 from 68 pF to 47 pF and C58 from 47 pF to 68 pF. Changed R239 from 100 Ω to 33 Ω. D2 Changed A2C208, A2C210, A2C212, A2C215, A2C220, A2C235-A2C240 from 351-4068-170 to 913-3667-190 (no schematic change). Changed A2C225 from 33 pF to 47 pF. Added A2L214, 0.33 μH. Changed A2Q201-A2Q204 from 352-6003-010 to 646-7028-001 (no schematic change). Changed: A2R221 from 1800 Ω to 1000 Ω. A2R222 from 820 Ω to 680 Ω. A2R237 from 150 Ω to 560 Ω. Deleted A2R238, 75 Ω, from in parallel with A2C247. Added A2R247, 220 Ω. D3 Added A1CR19 and A1CR20, 1N4454 635-0782-002, REV T and above 637-1767-002 only, REV R and above 635-0784-002, REV P and above 635-0782-002/-004, REV AA and above 635-0782-002/-004, REV AB and above 635-0784-002, REV R and above 637-1767-003, REV Y and above 642-3587-001, REV B and above 635-0780-004, REV R and above		

RF Translator, Schematic Diagram
Figure 5 (Sheet 6)

PARTS LIST (Cont)

MODIFICATION HISTORY (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY	REVISION IDENT
CR26, CR27 C1-C58	SEMICONO DEVICE NOT USED	922-6119-010		28480		Changed: A3C61 from 33 pF to 27 pF. A3C73 from 0.01 μ F to 0.1 μ F A3L34 from 0.39 μ H to 0.33 μ H. A3R80 from 82 Ω to 68 Ω .		Modifica 637-176
C59	CAPACITOR,FXD CER DIEL, 36PF, 5%, 50V	913-3279-200		16546				
C60	CAPACITOR,FXD MICA DIEL, 36PF, 5%, 50V	912-4141-240		72136				
C61	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V (A4)	912-4141-220		72136				
C61	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		72136				
C62	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349				
C63	CAPACITOR,FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		72136				
C64	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370		72136		Added A2L69, 0.15 μ H.	635-0782-002,	C4
C65	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (A6)	913-4018-000		81349		Added A2R144, 110 Ω .	REV G and	
C65	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 50V	912-4141-450		72136		Added A2R145, 110 Ω .	above	
C66	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546		Changed: A2C48 from 18 pF to 20 pF.		C5
C67	CAPACITOR,FXD MICA DIEL, 240PF, 5%, 50V	912-4141-460		72136		A2C49 from 18 pF to 20 pF.		
C68	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546		A2C77 from 1000 pF to 47 pF.		
C69	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349		A2L19 from 2.7 μ H to 1.0 μ H.		
C70	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546		A2L20 from 2.7 μ H to 1.0 μ H.		C6
C71	CAPACITOR,FXD MICA DIEL, 62PF, 5%, 50V	912-4141-320		72136		A2R47 from 82 Ω to 68 Ω .		
C72	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		72136		A2R51 from 47 Ω to 100 Ω .		
C73	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V (A4)	913-3279-110		16546				
C73	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V (C9)	913-3279-180		16546				
C73	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-200		16546				
C74,C75	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-200		16546		Changed A3C65 from 1000 pF to 220 pF.	635-0784-002,	C7
C76	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546			REV D and	
C77	NOT USED						above	
C78	CAPACITOR,FXD MICA DIEL, 24PF, PORM 0.5PF, 50V	912-4141-160		72136				
C79,C80	NOT USED							
C81	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	None	Changed second mixer A3 635-0784-002 baseboard configuration from 600-1993-717 CI 77116 to 600-1993-717 CI 77486.	635-0784-002,	C8
C82-C122	NOT USED						above	
C123	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V (A4)	912-4141-180		72136				
C123	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349				
C124	NOT USED							
C125	CAPACITOR,FXD CER DIEL, 4700PF, 20%, 50V (A4)	913-3279-090		16546				
L1-L25	NOT USED							C9
L26	COIL,RF,VAR	242-0439-020		02113		All changes to 635-0784-002 shown in the remainder of this modification history are for the current configuration baseboard 600-1993-717 CI 77486.		
L27	COIL,RF 2.70UH	240-2028-000		96906				
L28	COIL,RF 22UH	240-2039-000		96906				
L29	COIL,RF,VAR	242-0439-020		02113				
L30	COIL,RF 2.70UH	240-2028-000		96906	7	Changed: A2R44 from 18 Ω to 22 Ω .	635-0782-002,	
L31	COIL,RF 27UH	240-2040-000		96906		A2R45 from 18 Ω to 22 Ω .	REV J and	
L32,L33	COIL,RF 0.15UH	240-2013-000		96906			above	Modifica
L34	COIL,RF 0.39UH (A4)	240-2018-000		96906		Changed R139 from 180 Ω to test select of 82 Ω to 220 Ω .	637-1767-001,	incorpor
L34	COIL,RF 0.33UH (A9)	240-2017-000		96906	11		REV F and	
L34	COIL,RF 0.27UH (C3)	240-2016-000		96906			above	
L34	COIL,RF 0.33UH	240-2017-000		96906				
L35	NOT USED							
L36	COIL,RF 220UH (A4)	240-2723-060		96906				D1
M1	MIXER,RF (C6)	277-0405-010		05375	8	Added C127, test select of 1 pF or 2 pF.	637-1767-001,	
M1	MIXER,RF	277-0405-020					REV H and	
Q1-Q11	NOT USED						above	
Q12	TRANSISTOR,FET	352-1042-010		17856				
Q13	TRANSISTOR	352-0766-010		95445	9	Changed A3L34 from 0.33 μ H to 0.27 μ H.	635-0784-002,	
Q14	(SEE 637-1767-001)						REV G and	
RT1,RT2	NOT USED						above	
RT3	RESISTOR,THRM 40 OHMS, 10%, 0.5W	714-1725-000		10646				
R1-R51	NOT USED							
R52	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	10	Changed: A2C46 from 5 pF to 15 pF.	635-0782-002,	
R53	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349		A2C47 from 51 pF to 330 pF.	REV L and	
R54	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349			above	
R55	RESISTOR,FXD CHPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349				D2
R56,R57	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349				
R58	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/8W	745-2295-000		81349	1	Changed: A2C31 from 47 pF to 36 pF.	635-0782-002	
R59	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0704-000		81349		A2C56 from 0.01 μ F to 1400 pF.	REV M and	
R60,R61	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349			above	
R62	RESISTOR,FXD CHPSN, 4.7 OHMS, 5%, 1/4W	745-4382-000		81349				
R63	RESISTOR,FXD CHPSN, 15 OHMS, 10%, 1/4W	745-0683-000		81349	31	Added C130, 2.2 μ F electrolytic.	637-1767-001,	
R64	RESISTOR,FXD CHPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349		Added C131, 2.2 μ F electrolytic.	REV K and	
R65	NOT USED					Added C132, 2.2 μ F electrolytic.	above	
R66,R67	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W (A3)	745-0749-000		81349		Added C133, 22 μ F electrolytic.		
R68	RESISTOR,VAR 100 OHMS, 30%, 1/2W	382-0008-040		73138		Changed L58 from 4.7 μ H to 120 μ H.		
R69	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349				
R70-R79	NOT USED							
R80	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/4W (A4)	745-0710-000		81349				
R80	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	32	Changed A1R4 from 2200 Ω to 15 k Ω .	635-0780-002	
R81-R142	NOT USED						REV H and	
R143	RESISTOR,FXD CHPSN, 22 OHMS, 10%, 1/4W (A4)	745-0689-000		81349			above	
T1-T4	NOT USED							
T5	TRANSFORMER,RF	278-0430-170		03550		Changed: A2R37 from 270 Ω to 220 Ω .	635-0782-002,	
T6	TRANSFORMER,RF	278-0430-150		03550	2	A2R43 from 1500 Ω to 2200 Ω .	REV R and	
							above	
					C3	Changed L34 from 0.27 μ H to 0.33 μ H.	635-0784-002,	
							REV M and	
							above	D3
					B3	Changed: C57 from 56 pF to 68 pF. C58 from 56 pF to 47 pF.	637-1767-001,	
							REV P and,	
							above	

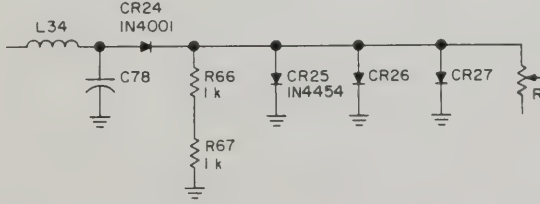
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
CR26, CR27	SEMICONO DEVICE	922-6119-010		28480	1M5767
C1-C58	NOT USED				
C59	CAPACITOR,FXD MICA DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C60	CAPACITOR,FXD MICA DIEL, 34PF, 5%, 50V	912-4141-240		72136	DMSE360J050WV
C61	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V (A4)	912-4141-220		72136	DMSE330J050WV
C61	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		72136	DMSE270J050WV
C62	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C63	CAPACITOR,FXD MICA DIEL, 15PF, PORM 0.5PF, 300V	912-4141-130		72136	DMSC150D300WV
C64	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370		72136	DMSF111J050WV
C65	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (A6)	913-4018-000		81349	CK05BX102K
C65	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 50V	912-4141-450		72136	DMSF221J050WV
C66	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C67	CAPACITOR,FXD MICA DIEL, 240PF, 5%, 50V	912-4141-460		72136	DMSF241J050WV
C68	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C69	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C70	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C71	CAPACITOR,FXD MICA DIEL, 62PF, 5%, 50V	912-4141-320		72136	DMSE620J050WV
C72	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		72136	DMSF151J050WV
C73	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V (A4)	913-3279-110		16546	CY20C103M
C73	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V (C9)	913-3279-180		16546	CY20C104M
C73	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C74,C75	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C76	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C77	NOT USED				
C78	CAPACITOR,FXD MICA DIEL, 24PF, PORM 0.5PF, 50V	912-4141-160		72136	DMSE240D050WV
C79,C80	NOT USED				
C81	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C82-C122	NOT USED				
C123	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V (A4)	912-4141-180		72136	DMSE270J050WV
C123	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C124	NOT USED				
C125	CAPACITOR,FXD CER DIEL, 4700PF, 20%, 50V (A4)	913-3279-090		16546	CY10C472M
L1-L25	NOT USED				
L26	COIL,RF,VAR	242-0439-020		02113	242-0439-020
L27	COIL,RF 2.70UH	240-2028-000		96906	HS75084-05
L28	COIL,RF 22UH	240-2039-000		96906	HS75084-16
L29	COIL,RF,VAR	242-0439-020		02113	242-0439-020
L30	COIL,RF 2.70UH	240-2028-000		96906	HS75084-05
L31	COIL,RF 27UH	240-2040-000		96906	HS75084-17
L32,L33	COIL,RF 0.15UH	240-2013-000		96906	HS75083-03
L34	COIL,RF 0.39UH (A4)	240-2018-000		96906	HS75083-08
L34	COIL,RF 0.33UH (A9)	240-2017-000		96906	HS75083-07
L34	COIL,RF 0.27UH (C3)	240-2016-000		96906	HS75083-06
L34	COIL,RF 0.33UH	240-2017-000		96906	HS75083-07
L35	NOT USED				
L36	COIL,RF 220UH (A4)	240-2723-060		96906	HS75085-11
M1	MIXER,RF (C6)	277-0405-010		05375	CH1P
M1	MIXER,RF	277-0405-020			
Q1-Q11	NOT USED				
Q12	TRANSISTOR,FET	352-1042-010		17856	U310
Q13	TRANSISTOR	352-0766-010		95445	2N5109
Q14	(SEE 637-1767-001)				
RT1,RT2	NOT USED				
RT3	RESISTOR,THRM 40 OHMS, 10%, 0.5W	714-1725-000		10646	0325F5-016
R1-P51	NOT USED				
R52	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR07G470KS
R53	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RCR07G680KS
R54	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR07G471KS
R55	RESISTOR,FXD CHPSN, 27 OHMS, 10%, 1/4W	745-0692-000		81349	RCR07G270KS
R56,R57	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR07G272KS
R58	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/8W	745-2295-000		81349	RCR05G560KS
R59	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0704-000		81349	RCR07G560KS
R60,R61	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR07G272KS
R62	RESISTOR,FXD CHPSN, 4.7 OHMS, 5%, 1/4W	745-4382-000		81349	RCR07G477JS
R63	RESISTOR,FXD CHPSN, 15 OHMS, 10%, 1/4W	745-0683-000		81349	RCR07G150KS
R64	RESISTOR,FXD CHPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349	RCR07G151KS
R65	NOT USED				
R66,R67	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W (A3)	745-0749-000		81349	RCR07G102KS
R68	RESISTOR,VAR 100 OHMS, 30%, 1/2W	382-0008-040		73138	62PR100
R69	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R70-R79	NOT USED				
R80	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/4W (A4)	745-0710-000		81349	RCR07G820KS
R80	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W	745-0707-000		81349	RCR07G680KS
R81-R142	NOT USED				
R143	RESISTOR,FXD CHPSN, 22 OHMS, 10%, 1/4W (A4)	745-0689-000		81349	RCR07G220KS
T1-T4	NOT USED				
T5	TRANSFORMER,RF	278-0430-170		03550	22026
T6	TRANSFORMER,RF	278-0430-150		03550	22028

MODIFICATION HISTORY

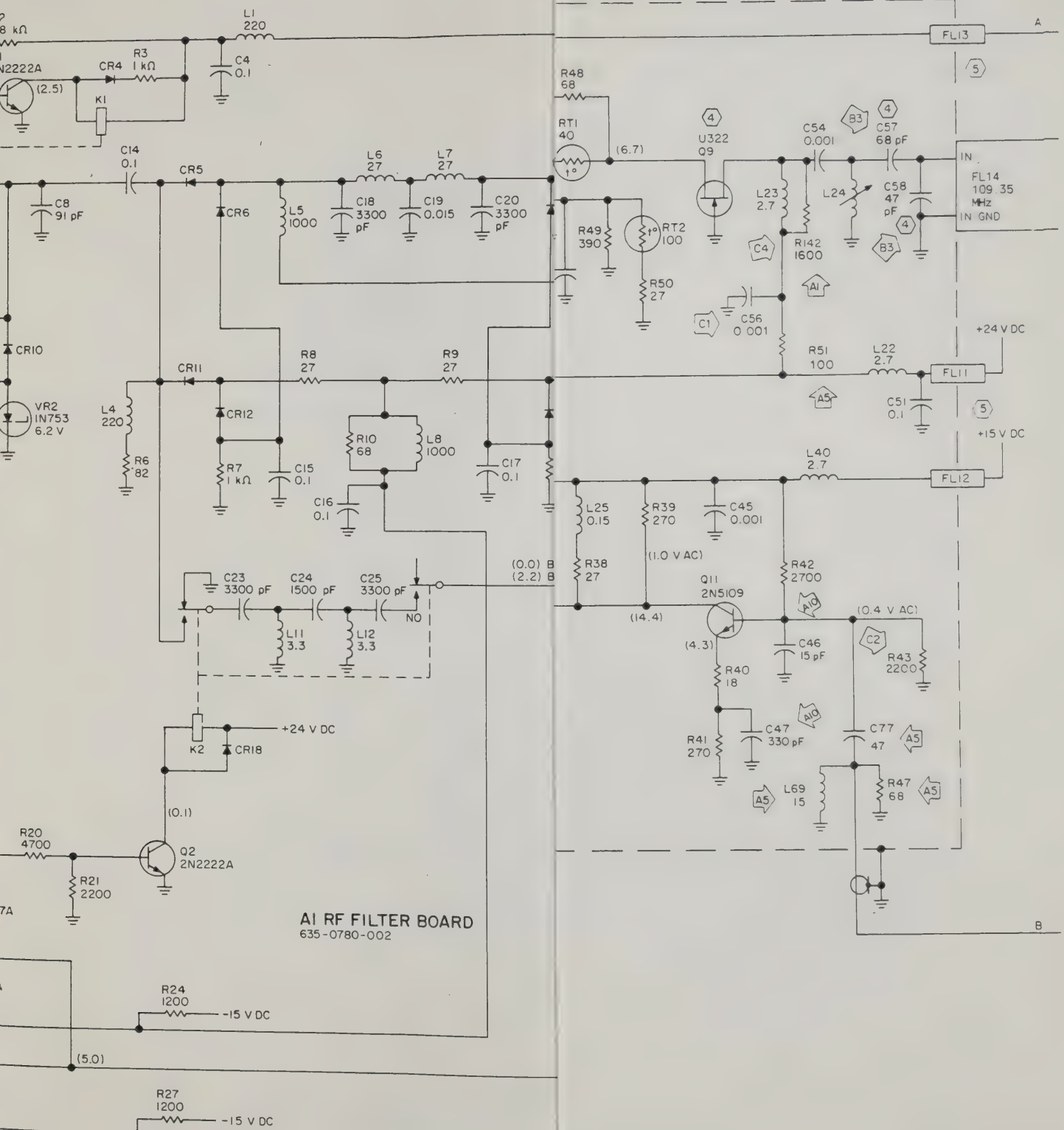
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
	Note	
	First mixer board A2 635-0782-002 has used three configurations of baseboard 600-1993-716. These baseboard configurations are identified only by the CI stamped following the baseboard number. Each baseboard may contain a different component layout and/or different printed circuits.	
	a. Initial configuration 600-1993-716 CI 77116	
	b. Revised configuration 600-1993-716 CI 77266	
	c. Current configuration 600-1993-716 CI 77486	
	Changes to configurations a and b were made only to update cards in factory stock to the current configuration at the time of the revision.	
	FIRST MIXER BOARD A2 635-0782-002 BASEBOARD 600-1993-716 CI 77116 MODIFICATION HISTORY	
	Note	
	Differences between 600-1993-716 CI 77116 before REV K and initial instruction book schematic/parts list are as follows:	
	C29 was 180 pF. L14 was 0.27 μH. C31 was 56 pF. R47 was 47 Ω.	
None	Changed: C29 from 180 pF to 150 pF. C31 from 56 pF to 36 pF. L14 from 0.27 μH to 0.22 μH.	REV K and above
A1	Added R142,2200 Ω.	REV K and above
A5	Added: R144, 110 Ω. R145, 110 Ω.	REV K and above
	Changed: C48 from 18 to 20 pF. C49 from 18 to 20 pF. C77 from 1000 pF to 47 pF. L19 from 2.7 μH to 1.0 μH. L20 from 2.7 μH to 1.0 μH. R51 from 47 Ω to 100 Ω.	
A7	Changed: R44 from 18 Ω to 22 Ω. R45 from 18 Ω to 22 Ω.	REV K and above
A10	Changed: C46 from 5 pF to 15 pF. C47 from 51 pF to 330 pF.	REV K and above
	FIRST MIXER BOARD A2 635-0782-002 BASEBOARD 600-1993-716 CI 77266 MODIFICATION HISTORY	
	Note	
	600-1993-716 CI 77266 and initial instruction book schematic/parts list are compatible.	
A1	Added R142, 2200 Ω.	REV E and above
A5	Added: L69, 0.15 μH. R144, 110 Ω. R145, 110 Ω. Changed: C48 from 18 pF to 20 pF. C49 from 18 pF to 20 pF. C77 from 1000 pF to 47 pF. L19 from 2.7 μH to 1.0 μH. L20 from 2.7 μH to 1.0 μH.	REV F and above

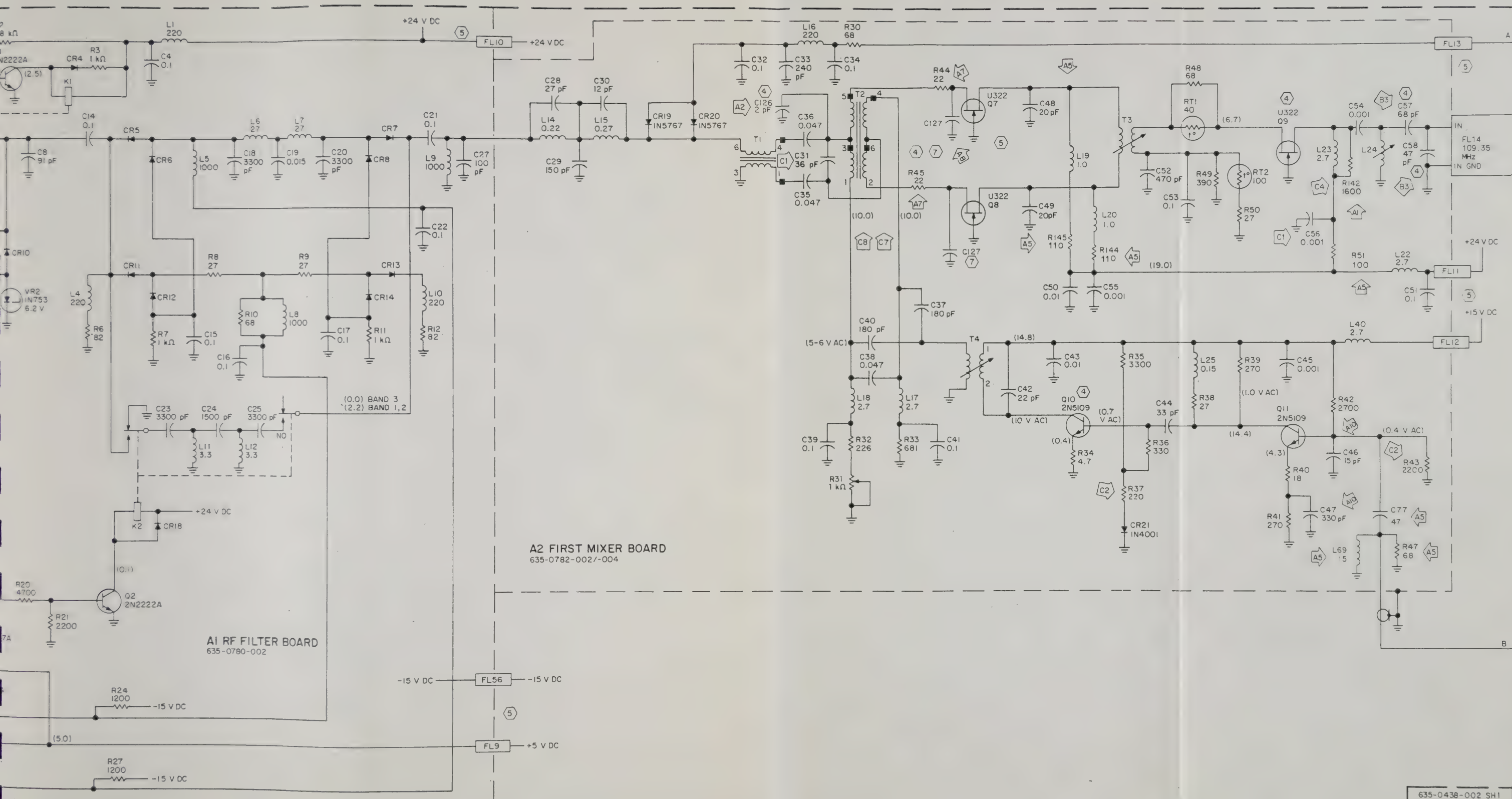
MODIFICATION HISTORY (Cont)

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
	R47 from 82 Ω to 68 Ω. R51 from 47 Ω to 100 Ω.	
A7	Changed: R44 from 18 Ω to 22 Ω. R45 from 18 Ω to 22 Ω.	REV H and above
A10	Changed: C46 from 5 pF to 15 pF. C47 from 51 pF to 330 pF.	REV W and above
C1	Changed: C56 from 0.01 pF to 1000 pF.	REV W and above
C2	Changed: R37 from 270 Ω to 220 Ω. R43 from 1500 Ω to 2200 Ω.	REV W and above
C4	Changed: R142 from 2200 Ω to 1600 Ω.	REV W And above
	Note	
	Second mixer board A3 635-0784-002 has used two configurations of baseboard 600-1993-717. These baseboard configurations are identified only by the CI stamped following the baseboard number. Each baseboard may contain a different component layout and/or different printed circuits.	
	a. Initial configuration 600-1993-717 CI 77116 (635-0784-002 through REV D).	
	b. Current configuration 600-1993-717 CI 77486.	
	Changes to configuration a (after REV D) were made only to update cards in factory stock to the current configuration at the time of the revision.	
	SECOND MIXER BOARD A3 635-0784-002 BASEBOARD 600-1993-717 CI 77116 MODIFICATION HISTORY (AFTER REV D)	
A4	Changed A3L34 from 0.33 μH to 0.27 μH.	REV H and above
	Note	
	All changes to 635-0782-002 shown in the remainder of this modification history are for the current configuration baseboard 600-1993-716 CI 77486.	
A1	Added A2R142, 2200 Ω.	635-0782-002, REV G and above
A2	Added C126, test select of 2 pF to 6 pF.	637-1767-001, REV C and above
A3	Deleted A3CR24, 1N4001; A3CR25, 1N4454; A3R66, 1 kΩ; and A3R67, 1 kΩ (circuit was as shown below).	635-0784-002, REV C and above
		
A4	Deleted A3L36, 220 μH (replaced with A3R143). Added A3C125, 4700 pF. Added A3R143, 22 Ω.	635-0784-002, REV C and above

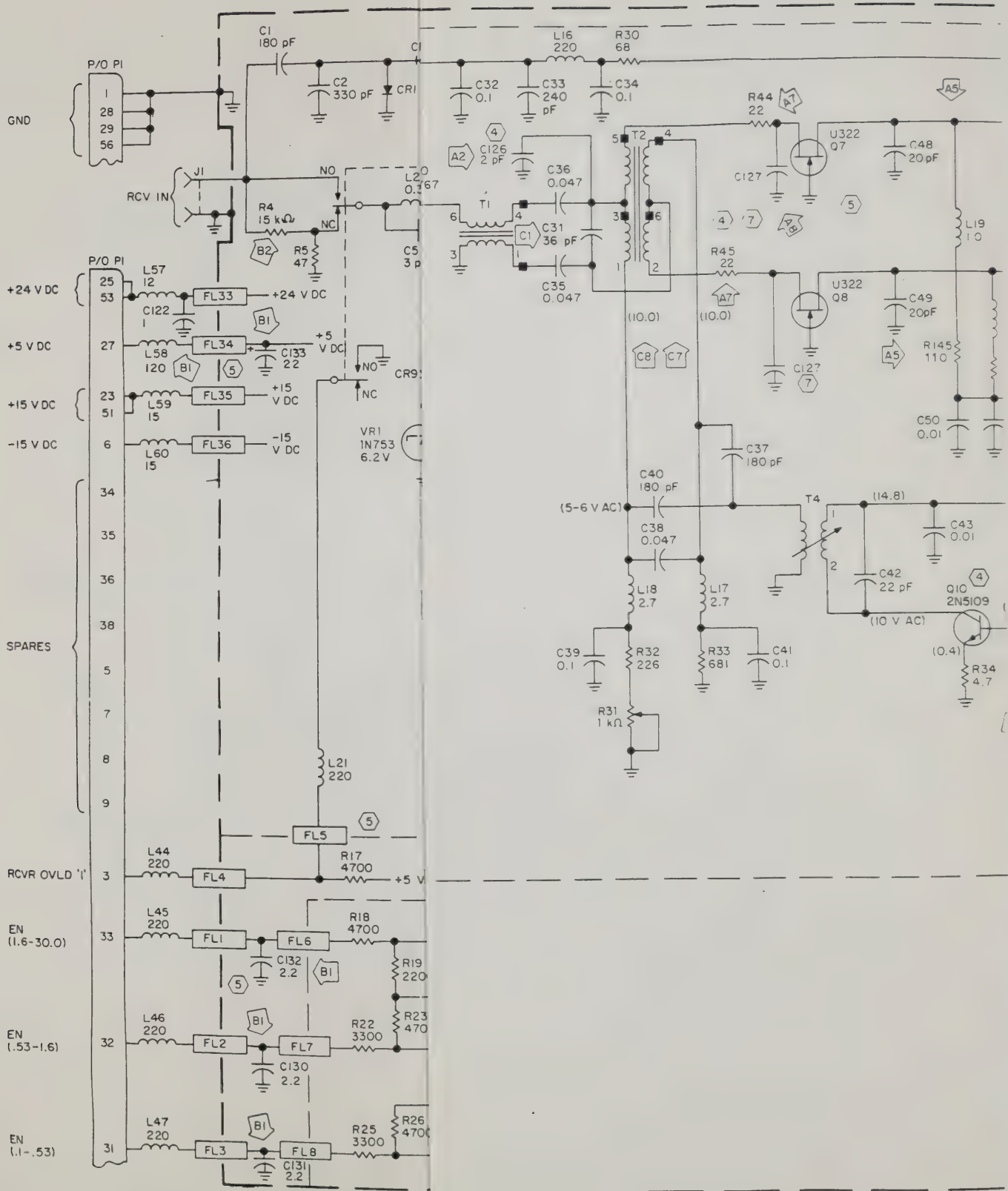
MODIFICATION HISTORY (Cont)

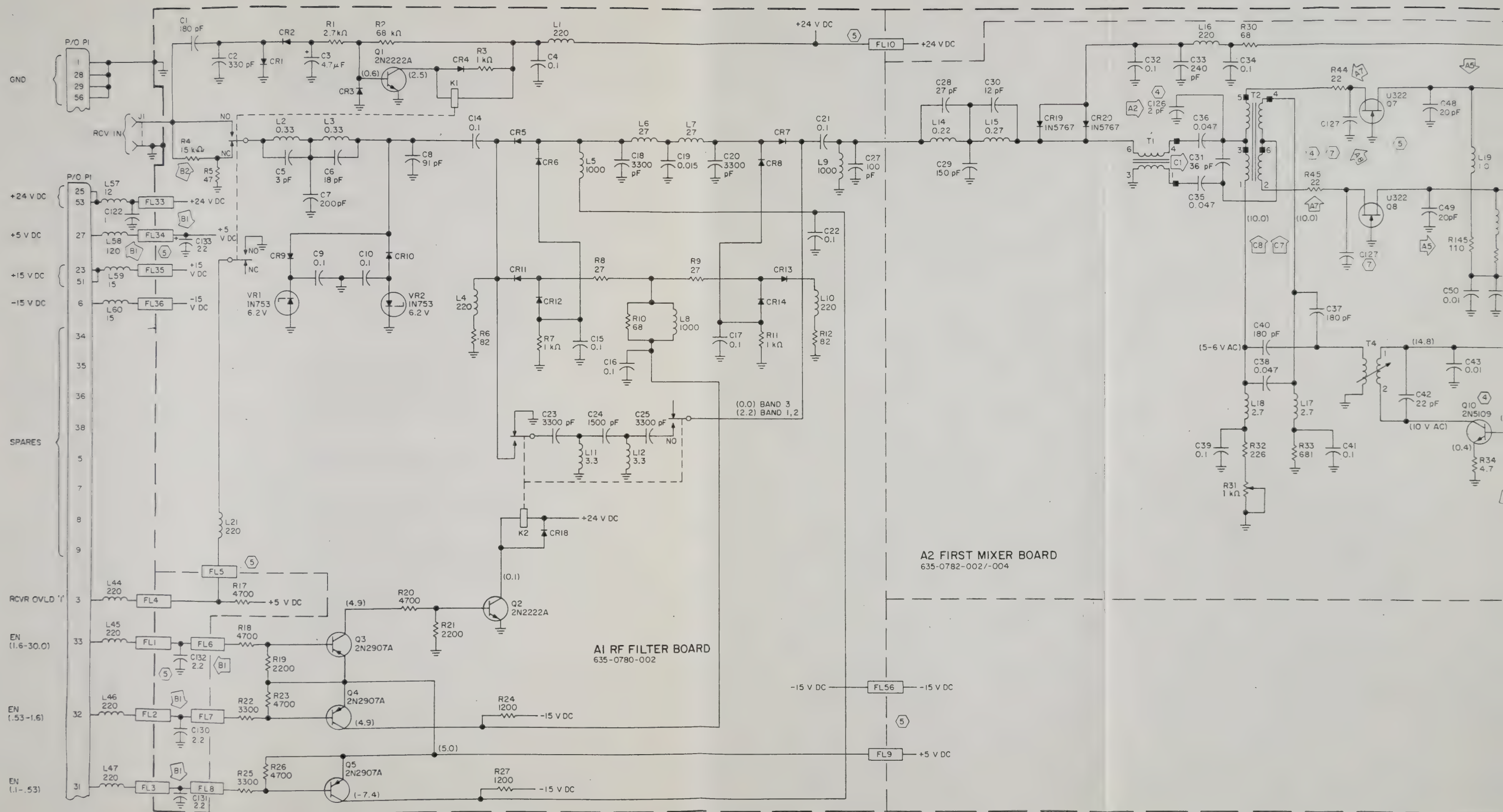
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
	Changed: A3C61 from 33 pF to 27 pF. A3C73 from 0.01 μF to 0.1 μF. A3L34 from 0.39 μH to 0.33 μH. A3R80 from 82 Ω to 68 Ω.	
A5	Added A2L69, 0.15 μH. Added A2R144, 110 Ω. Added A2R145, 110 Ω.	635-0782-002, REV G and above
	Changed: A2C48 from 18 pF to 20 pF. A2C49 from 18 pF to 20 pF. A2C77 from 1000 pF to 47 pF. A2L19 from 2.7 μH to 1.0 μH. A2L20 from 2.7 μH to 1.0 μH. A2R47 from 82 Ω to 68 Ω. A2R51 from 47 Ω to 100 Ω.	
A6	Changed A3C65 from 1000 pF to 220 pF.	635-0784-002, REV D and above
None	Changed second mixer A3 635-0784-002 baseboard configuration from 600-1993-717 CI 77116 to 600-1993-717 CI 77486.	635-0784-002, REV E and above
	Note	
	All changes to 635-0784-002 shown in the remainder of this modification history are for the current configuration baseboard 600-1993-717 CI 77486.	
A7	Changed: A2R44 from 18 Ω to 22 Ω. A2R45 from 18 Ω to 22 Ω.	635-0782-002, REV J and above
A11	Changed R139 from 180 Ω to test select of 82 Ω to 220 Ω.	637-1767-001, REV F and above
A8	Added C127, test select of 1 pF or 2 pF.	637-1767-001, REV H and above
A9	Changed A3L34 from 0.33 μH to 0.27 μH.	635-0784-002, REV G and above
A10	Changed: A2C46 from 5 pF to 15 pF. A2C47 from 51 pF to 330 pF.	635-0782-002, REV L and above
C1	Changed: A2C31 from 47 pF to 36 pF. A2C56 from 0.01 μF to 1400 pF.	635-0782-002, REV M and above
B1	Added C130, 2.2 μF electrolytic. Added C131, 2.2 μF electrolytic. Added C132, 2.2 μF electrolytic. Added C133, 22 μF electrolytic. Changed L58 from 4.7 μH to 120 μH.	637-1767-001, REV K and above
E2	Changed A1R4 from 2200 Ω to 15 kΩ.	635-0780-002, REV H and above
C2	Changed: A2R37 from 270 Ω to 220 Ω. A2R43 from 1500 Ω to 2200 Ω.	635-0782-002, REV R and above
C3	Changed L34 from 0.27 μH to 0.33 μH.	635-0784-002, REV M and above
B3	Changed: C57 from 56 pF to 68 pF. C58 from 56 pF to 47 pF.	637-1767-001, REV P and, above

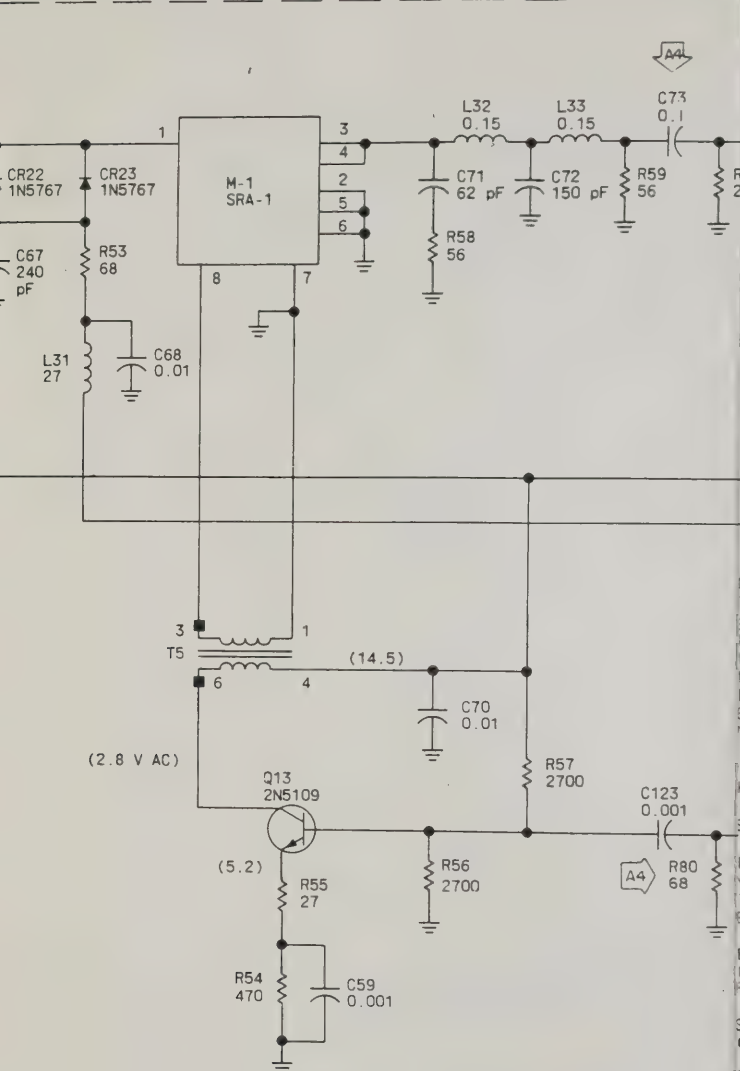
RF Translator (637-1767-001, -002), Schematic Diagram
Figure 5 (Sheet 7)



RF Translator (637-1767-001, -002), Schematic Diagram
Figure 5 (Sheet 7)







LESS OTHERWISE SPECIFIED, RESISTANCE
VALUES ARE IN OHMS, CAPACITANCE VALUES
IN MICROFARADS, AND INDUCTANCE
VALUES ARE IN MICROHENRYS.

LESS OTHERWISE SPECIFIED, DIODES
TYPE 1N4454.

INITIAL REFERENCE DESIGNATIONS ARE
DOWN, FOR COMPLETE DESIGNATION
PREFIX WITH UNIT AND/OR ASSEMBLY
SIGNIFICATION.

INSTALLED ON NEXT HIGHER ASSEMBLY
(7-1767-001, -002, -003, -004).

ALL FILTERS ARE 1750 pF, EXCEPT
BANDPASS FILTER FL14.

Q2, A2Q7 AND A2Q8, MATCHED SET.

TEST SELECT: R139 FROM 82Ω TO 270Ω.

- C126 FROM 2pF TO 6pF OR REMOVED (A2)
- C127 FROM 1pF OR 2pF OR REMOVED (A2)
- C206 1pF, 2pF, 3pF OR REMOVED (DI)
- C211 1pF, 2pF, 3pF OR REMOVED (DI)
- C248 1pF, 2pF, 3pF OR REMOVED (DI)
- C249 1pF, 2pF, 3pF OR REMOVED (DI)
- C250 1pF, 2pF, 3pF OR REMOVED (DI)

FOR 637-1767-001, DELETE C129 AND REPLACE Z1
WITH BUS WIRE, COMPONENTS C129 AND Z1 ARE
DELETED ON 637-1767-002 ONLY.

Q14 ON 637-1767-001 IS 293-1220-030.

Q14 ON 637-1767-002 IS 293-1330-010.

Q14 ON 637-1767-004 IS 293-1330-010.

FOR 637-1767-003, USE SHEET 3 INSTEAD OF
SHEET 1, SHEET 3 APPLICABLE ONLY TO
637-1767-003.

MULTIPLE LOCATIONS ARE SHOWN FOR TEST SELECT
CAPACITORS C206, C211, C248, C249, AND C250. CAPACITORS
TO BE ADDED AT LOCATIONS SHOWN OR DELETED PER
TEST REQUIREMENTS (671-1703-001).

THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE
SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING
METHODS AND MATERIALS MUST BE USED TO
PREVENT EQUIPMENT DAMAGE.

PART DESIGNATIONS SHOWN MAY BE GENERIC IN
FORM AND ARE FOR REFERENCE ONLY. SEE
APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.

TEST SELECT CAPACITOR C250 MAY BE

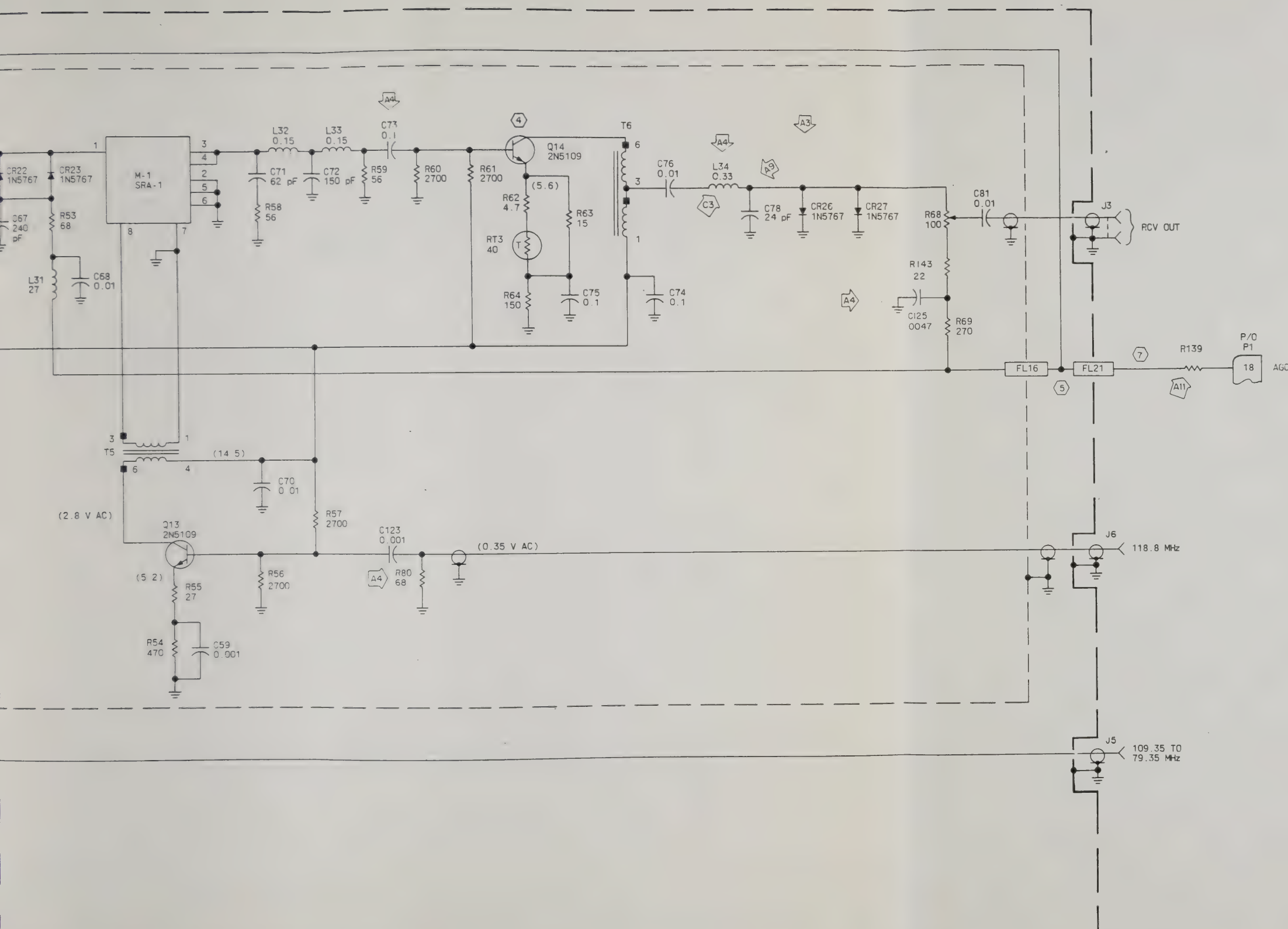
CATED BETWEEN POINTS:

A AND E, F, G, OR H

B AND E, F, G, OR H

C AND E, F, G, OR H

D AND E, F, G, OR H (DI)

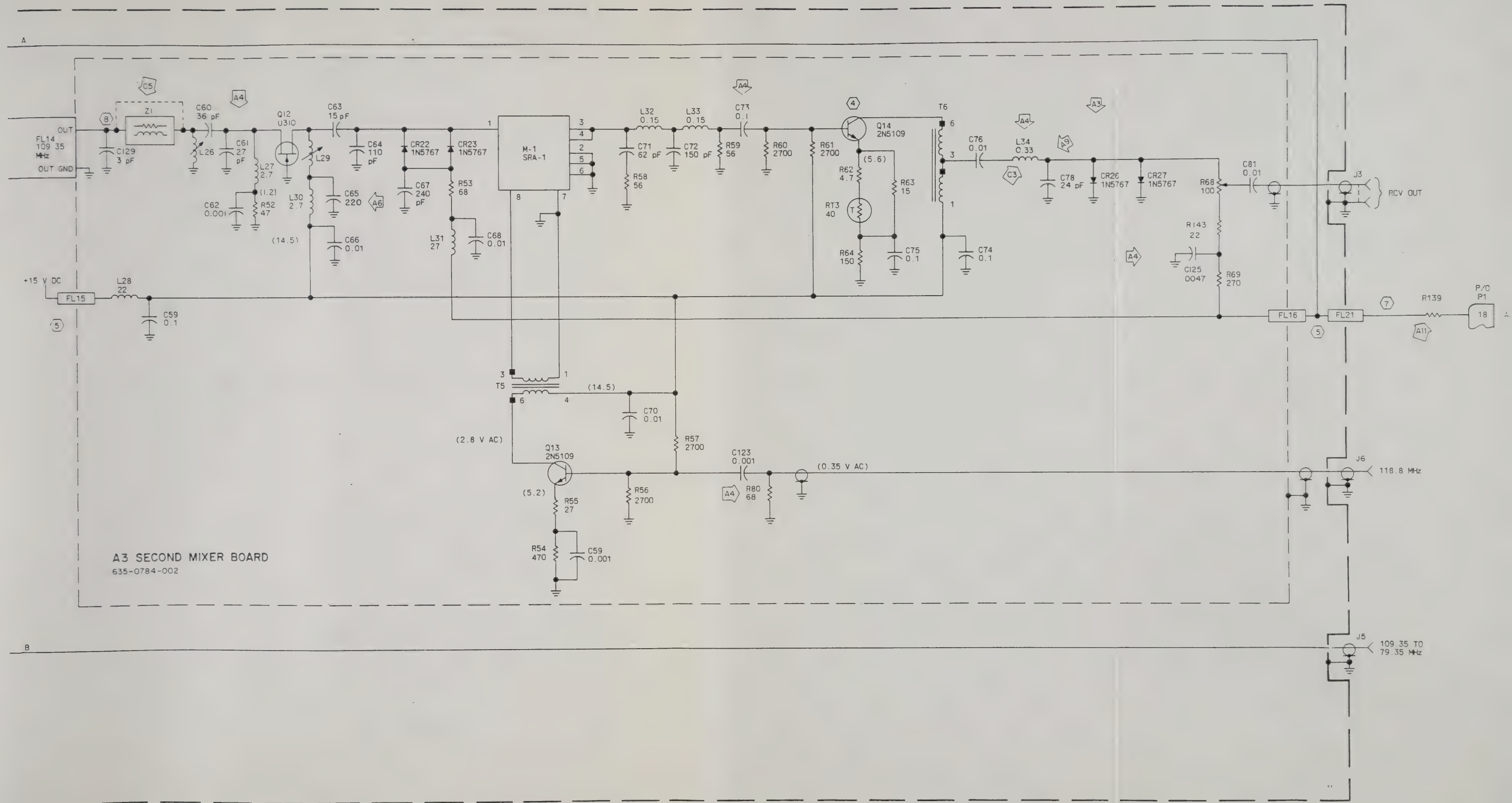


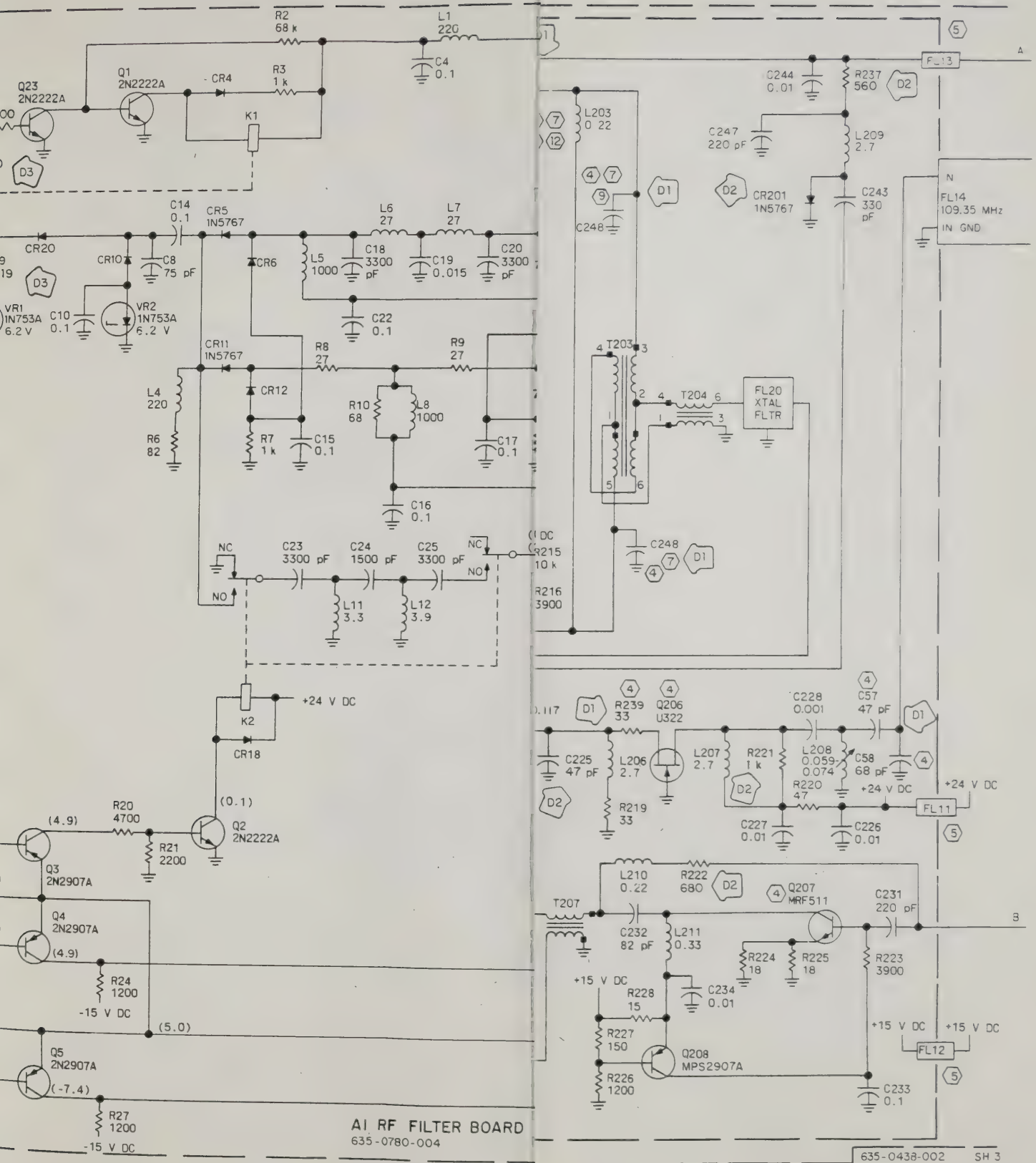
NOTES:

- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRYS.
- ② UNLESS OTHERWISE SPECIFIED, DIODES ARE TYPE 1N4454.
- ③ PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ④ INSTALLED ON NEXT HIGHER ASSEMBLY (637-1767-001, -002, -003, -004).
- ⑤ ALL FILTERS ARE 1750 pF, EXCEPT BANDPASS FILTER FL14.
- ⑥ U322, A2Q7 AND A2Q8, MATCHED SET.
- ⑦ TEST SELECT: R139 FROM 82Ω TO 270Ω.
 C126 FROM 2pF TO 6pF OR REMOVED
 C127 FROM 1pF OR 2pF OR REMOVED
 C206 1pF, 2pF, 3pF OR REMOVED
 C211 1pF, 2pF, 3pF OR REMOVED
 C248 1pF, 2pF, 3pF OR REMOVED
 C249 1pF, 2pF, 3pF OR REMOVED
 C250 1pF, 2pF, 3pF OR REMOVED
- ⑧ FOR 637-1767-001, DELETE C129 AND REPLACE Z1 WITH BUS WIRE, COMPONENTS C129 AND Z1 ARE USED ON 637-1767-002 ONLY.
 FL14 ON 637-1767-001 IS 293-1220-030.
 FL14 ON 637-1767-002 IS 293-1330-010.
 FL14 ON 637-1767-004 IS 293-1330-010.
 FOR 637-1767-003, USE SHEET 3 INSTEAD OF SHEET 1, SHEET 3 APPLICABLE ONLY TO 637-1767-003.
- ⑨ MULTIPLE LOCATIONS ARE SHOWN FOR TEST SELECT CAPACITORS C206, C211, C248, C249, AND C250. CAPACITORS ARE ADDED AT LOCATIONS SHOWN OR DELETED PER TEST REQUIREMENTS (671-1703-001).
- ⑩ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
- ⑪ TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
- ⑫ TEST SELECT CAPACITOR C250 MAY BE LOCATED BETWEEN POINTS:
 A AND E, F, G, OR H
 OR B AND E, F, G, OR H
 OR C AND E, F, G, OR H
 OR D AND E, F, G, OR H

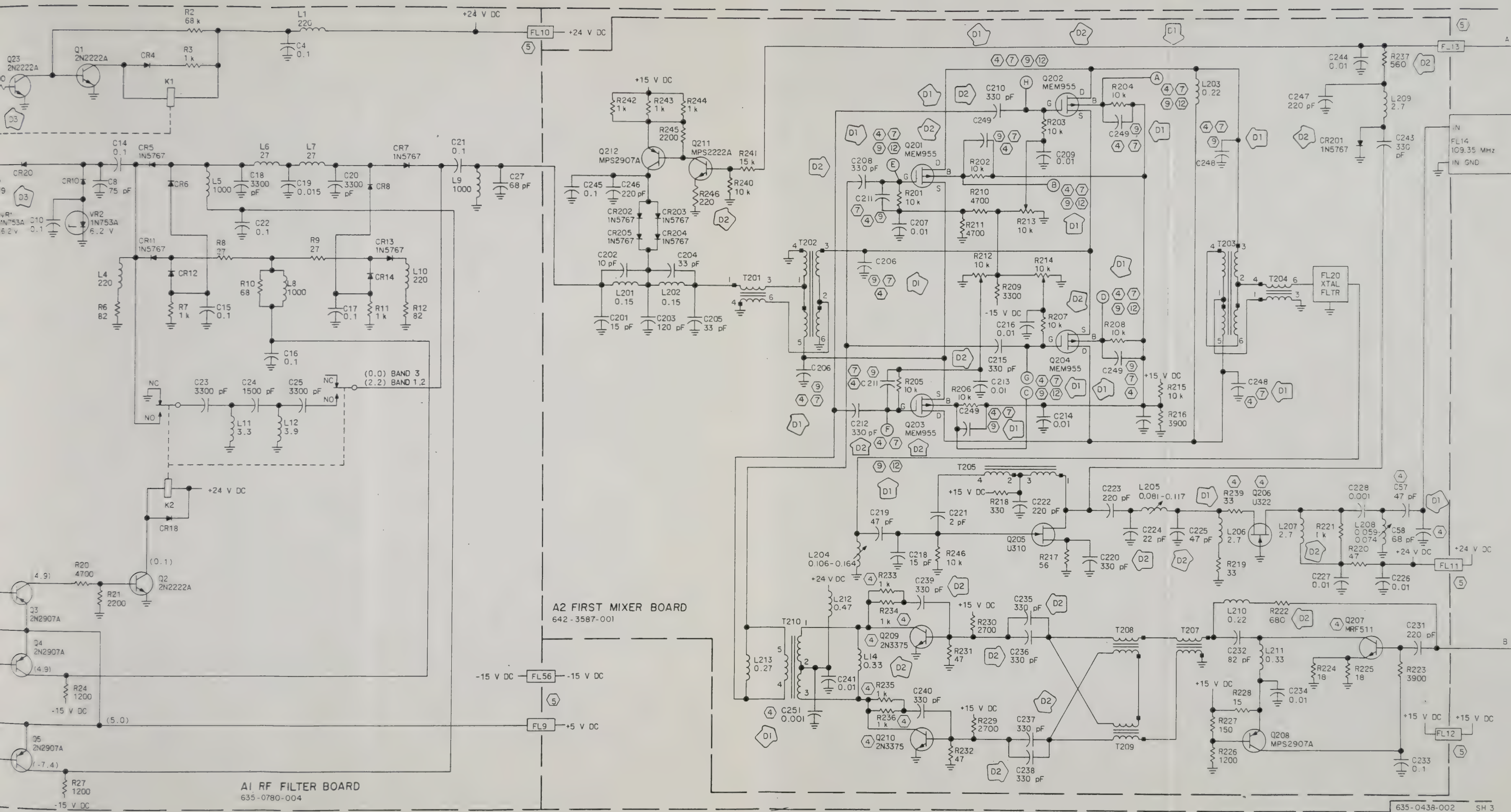
635-0438-002 SH 2

RF Translator, Schematic Diagram
Figure 5 (Sheet 8)

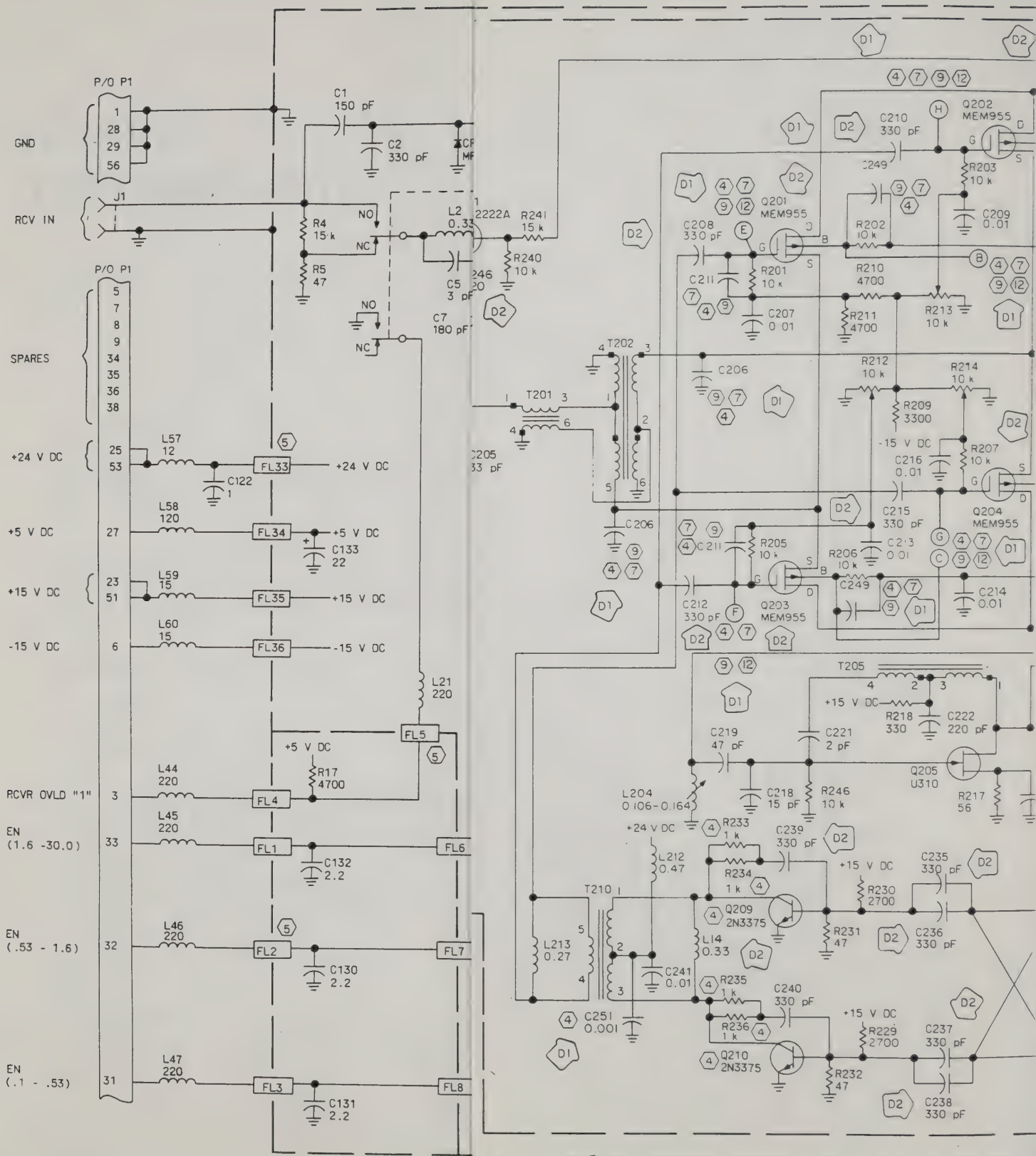




RF Translator (637-1767-003 only), Schematic Diagram
Figure 5 (Sheet 9)



RF Translator (637-1767-003 only), Schematic Diagram
Figure 5 (Sheet 9)





Rockwell
International

instructions

Collins Telecommunications Products Division

523-0770710-001211

1 January 1981

Control

(638-6629-001)

Printed in USA

Control
(638-6629-001)

1. DESCRIPTION

Control 638-6629-001, shown in figure 1, is a 2-layer planar card with a 130-pin edge-on connector (2 layers, 65 pins each).

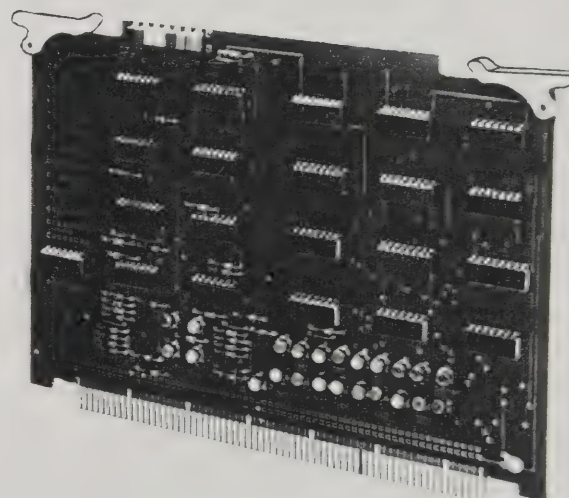
The control card consists of bcd parallel frequency control circuits, frequency band control circuits, tune start control circuit, receive mode enable circuits, and monitor control circuits.

2. PRINCIPLES OF OPERATION

2.1 General

The control card:

- a. Receives parallel bcd inputs and supplies buffered, current-driven parallel bcd outputs.
- b. Uses the parallel bcd inputs to produce frequency band control outputs.
- c. Produces a receiver fault output from a fault summary circuit having fault inputs from:
 1. Power supply
 2. Frequency reference
 3. Synthesizer
 4. Vbfo
 5. Subcarrier
- d. Produces an rf overload indication from a fault summary of the preselector and the receiver rf overload inputs.
- e. Receives a preselector fault signal and supplies a buffered, current-driven preselector fault output.
- f. Receives a local frequency change, vbfo frequency change, remote frequency change, or a local enable signal change and produces a tune start pulse output.



TPA-3067-017

Control
Figure 1

- g. Receives CW, A1, and ISB enable signals to produce an A1/CW or 450-kHz enable output; and A2 and B2 enable signals, to produce a subcarrier enable output.

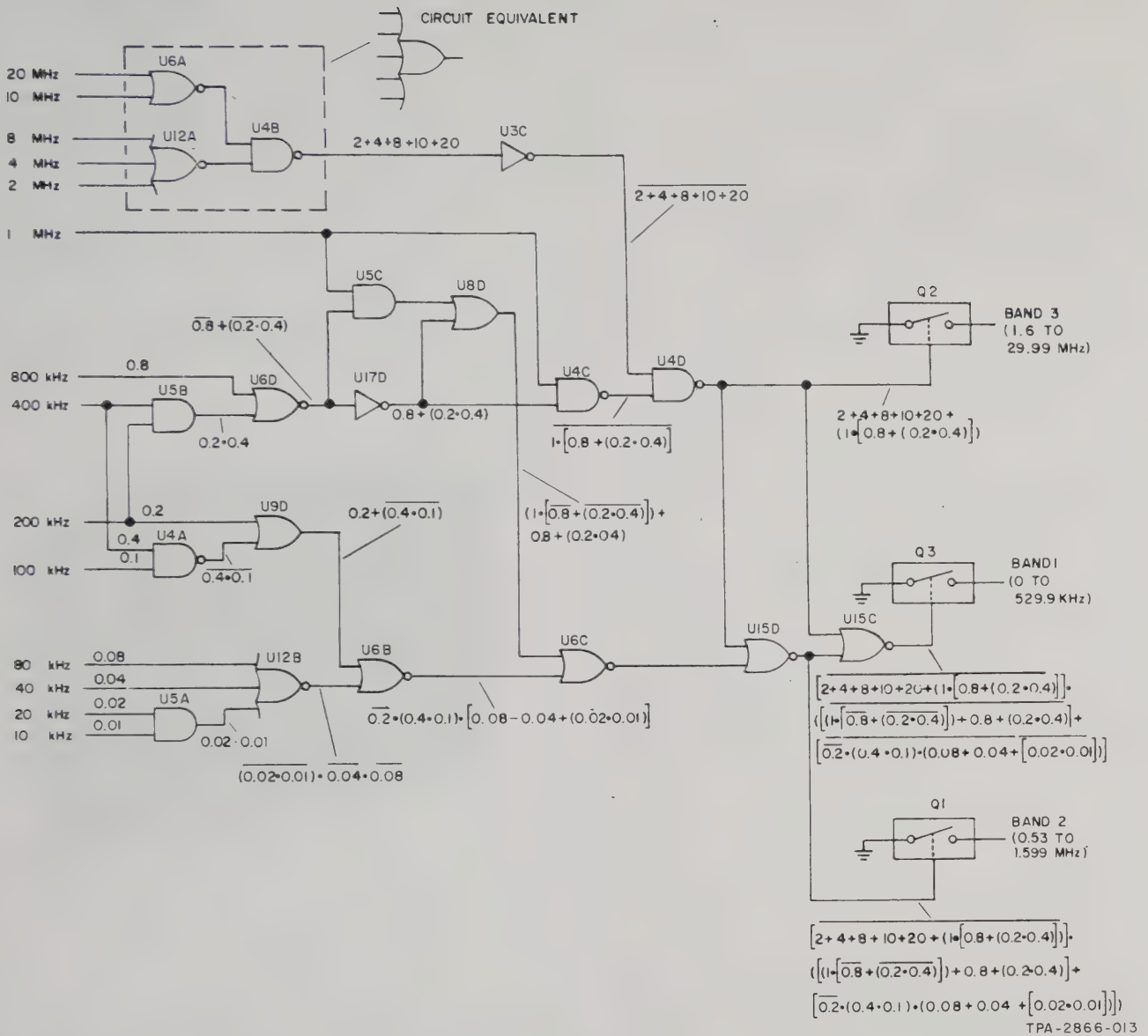
2.2 BCD Frequency Control Circuits (Refer to figure 6.)

The bcd frequency control circuits are parallel-to-parallel bcd control signals. Bcd signals from 1 kHz to 20 MHz are supplied to the control card and provide transistor-switched ground or open-circuit output signals.

2.3 Band Control Output Circuits (Refer to figure 2.)

The band control output circuits receive parallel bcd input control signals and convert them to three band

523-0770710-001211



Band Control Output Circuits
Figure 2

output signals. Frequency ranges of the bands are as follows: band 1 — 0 to 529.9 kHz, band 2 — 530 kHz to 1.599 MHz, and band 3 — 1.600 to 29.999 MHz.

Refer to table 1 and figure 2, and note that any band frequency input that lies between the low and the high frequency of each band on the table provides the associated band output control signal.

2.4 Fault and Monitor Circuits (Refer to figure 3.)

The following fault and monitor circuits are included in this control card.

- a. Receiver fault signal (logic 1 = fault) is generated when one or more of the following input signals are logic 1:

1. Power supply fault
2. Subcarrier fault
3. Frequency reference fault
4. Synthesizer fault
5. Vbfo fault
6. Receiver fault input

A restored-power-on condition or a power supply fault input causes the receiver fault to be latched in the fault mode. The power supply fault is

Table 1. Band Control Circuits, Logic Table

FREQ- (MHz)	FREQ (MHz) CONTROL INPUTS														BAND
	20	10	8	4	2	1	0.8	0.4	0.2	0.1	0.08	0.04	0.02	0.01	
29.99	1	0	1	0	0	1	1	0	0	1	1	0	0	1	(max)
20.00	1	0	x	x	x	x	x	x	x	x	x	x	x	x	3
10.00	0	1	x	x	x	x	x	x	x	x	x	x	x	x	
8.00	x	x	1	0	0	x	x	x	x	x	x	x	x	x	
4.00	x	x	0	1	x	x	x	x	x	x	x	x	x	x	
2.00	x	x	0	x	1	x	x	x	x	x	x	x	x	x	
1.80	x	x	x	x	x	1	1	0	0	x	x	x	x	x	
1.60	0	0	0	0	0	1	0	1	1	0	0	0	0	0	(min)
1.59	0	0	0	0	0	1	0	1	0	1	1	0	0	1	(max)
1.50	0	0	0	0	0	1	0	1	0	1	x	x	x	x	2
1.40	0	0	0	0	0	1	0	1	x	x	x	x	x	x	
1.20	0	0	0	0	0	1	0	x	1	x	x	x	x	x	
1.10	0	0	0	0	0	1	0	x	x	1	x	x	x	x	
0.80	0	0	0	0	0	0	1	0	0	x	x	x	x	x	
0.60	0	0	0	0	0	0	0	1	1	x	x	x	x	x	
0.58	0	0	0	0	0	x	0	1	x	1	1	0	0	x	
0.54	0	0	0	0	0	x	0	1	x	1	0	1	x	x	(min)
0.53	0	0	0	0	0	0	0	1	0	1	0	0	1	1	
0.52	0	0	0	0	0	0	0	1	0	1	0	0	1	0	(max)
0.50	0	0	0	0	0	0	0	1	0	1	0	0	x	x	1
0.40	0	0	0	0	0	0	0	1	0	x	x	x	x	x	
0.20	0	0	0	0	0	0	0	0	1	x	x	x	x	x	
0.10	0	0	0	0	0	0	0	x	x	1	x	x	x	x	
0.08	0	0	0	0	0	0	0	x	x	x	1	0	0	x	
0.04	0	0	0	0	0	0	0	x	x	x	0	1	x	x	
0.03	0	0	0	0	0	0	0	x	x	x	0	x	1	1	
0.02	0	0	0	0	0	0	0	x	x	x	0	x	1	x	
0.01	0	0	0	0	0	0	0	x	x	x	x	x	x	1	
0.00	0	0	0	0	0	0	0	x	x	x	x	x	x	x	

1 = logic 1; 0 = logic 0

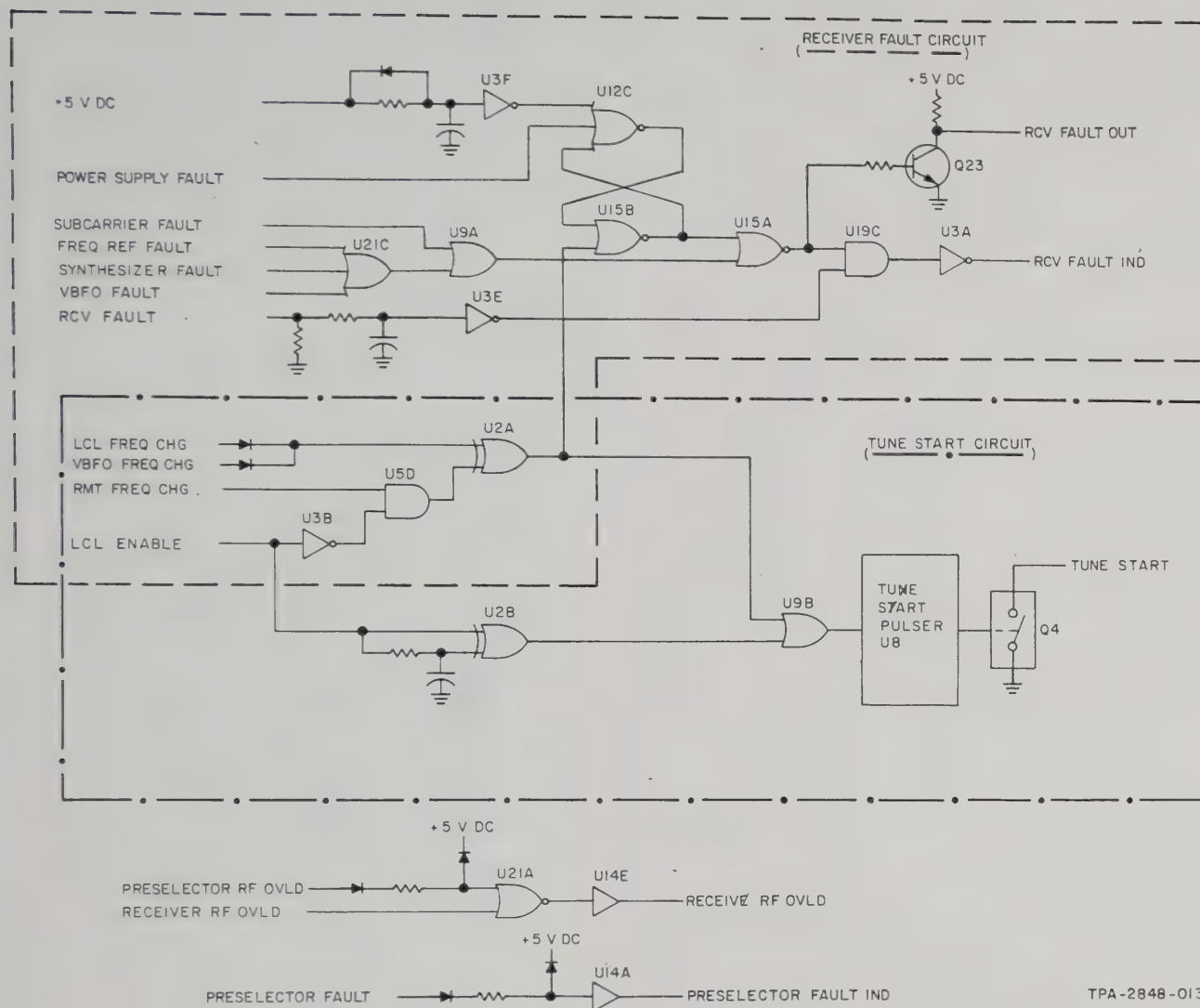
x = Either logic 1 or logic 0 except:
 Bcd for band 3 cannot exceed 29.999 MHz or fall below 1.60 MHz; bcd for band 2 cannot exceed 1.599 MHz or fall below 0.53 MHz; and bcd for band 1 cannot exceed 0.529 MHz.

cleared by changing frequency. The other faults are cleared when the fault is removed.

- b. Receive rf overload indication (logic 1 = overload) is generated by a preselector rf overload (logic 1) or a receive rf overload (logic 1) input. The +5 V dc connected through the diode in the preselector rf

overload input line is a high-level protector that prevents any signal in excess of +5 V dc from being applied to NOR gate U21A.

- c. Preselector fault indication (logic 1 = fault) is generated by a preselector fault (logic 1) input. The +5 V dc connected through the diode in the



Fault, Monitor, and Tune Start Circuits
Figure 3

preselector fault input line is a high-level protector that prevents any signal in excess of +5 V dc from being applied to buffer/driver U14A.

2.5 Tune Start Circuit (Refer to figure 3.)

The tune start pulse (ground at TP2) is initiated by making a frequency change or a change in the local-remote status to the receiver. The tune start pulser U8 is retriggerable and holds TP2 at ground as long as the frequency or local-remote status is constantly changing.

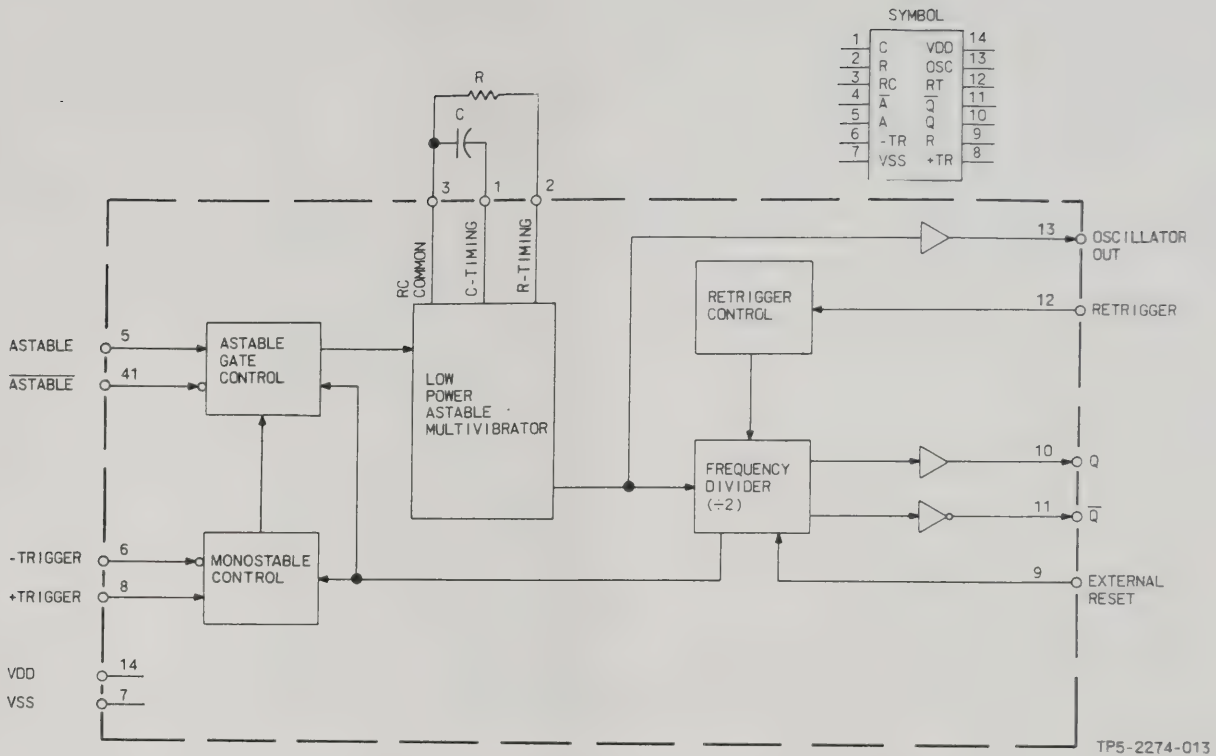
With the local enable signal (logic 1) applied, a logic 1 local frequency change signal applied causes a logic 1 + trigger to be applied to pulser U8 (monostable multivibrator).

With the local enable signal removed (logic 0 applied), a logic 1 remote frequency signal applied causes a logic 1 + trigger to be applied to pulser U8.

2.6 Monostable Multivibrator (COS/MOS Lower-Power Monostable/Astable Multivibrator 351-8200-020) (Refer to figure 4 and table 2.)

The 351-8200-020 is a gateable astable multivibrator with logic techniques incorporated to permit positive or negative edge-triggered monostable multivibrator action having retriggering and external counting options.

Inputs include + trigger, - trigger, astable, astable, retrigger, and external reset. Buffered outputs are Q, $\bar{Q}$, and oscillator. In all modes of operation, an external capacitor must be connected between C-timing



COS/MOS Linear Power Monostable/Astable Multivibrator, 351-8200-020

Figure 4

and RC-common terminals, and an external resistor must be connected between the R-timing and RC-common terminals.

Astable operation is enabled by a high level on the astable input. The period of the square wave at the Q and $\bar{Q}$ outputs in this mode of operation is a function of the external components employed. True input pulses on the astable input or complement pulses on the astable input allow the circuit to be used as a gateable multivibrator. An output whose period is half of that which appears at the Q terminal is available at the oscillator output terminal. However, a 50-percent duty cycle is not guaranteed at this output.

A high level should be applied to the external reset whenever VDD is applied or removed. In the monostable mode, positive-edge triggering is accomplished by application of a leading-edge pulse to the + trigger input and a low level to the - trigger input. For negative-edge triggering a trailing edge pulse is applied to the - trigger and a high level is applied to the + trigger. Input pulses may be of any duration relative to the output pulse. The multivibrator can be retriggered (on the leading edge only) by applying a common pulse to both the retrigger and trigger inputs. In this mode, the output pulse remains high as

long as the input pulse period is shorter than the period determined by the RC components.

An external countdown option can be implemented by coupling Q to an external N counter and resetting the counter with the trigger pulse. The counter output pulse is fed back to the astable input and has a duration equal to N times the period of the multivibrator.

A high level on the external reset input assures no output pulse during an ON power condition. This input can also be activated to terminate the output pulse at any time.

2.7 Exclusive OR Gate 351-8159-190 (Refer to figure 5.)

Exclusive OR gate 351-8159-190 consists of four 2-input exclusive OR gates in a package. The exclusive OR gate is commonly used as a pulse generator similar to that shown in figure 5.

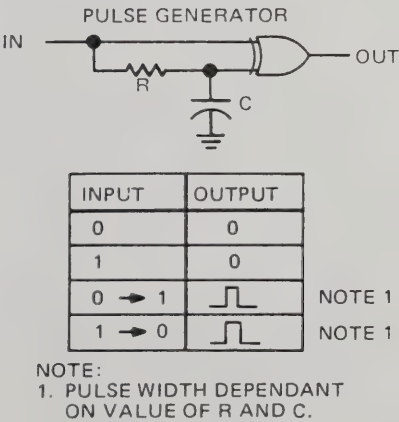
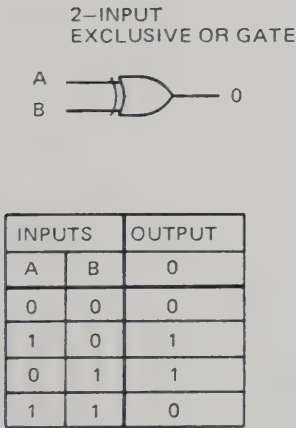
3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the control card are listed in the maintenance section of this instruction book.

Table 2. COS/MOS Linear Power Monostable/Astable Multivibrator 351-8200-020, Logic Truth Table.

FUNCTION	TERMINAL CONNECTIONS				OUTPUT PERIOD OR PULSE WIDTH
	VDD	VSS	INPUT PULSE	OUTPUT PULSE	
Astable multivibrator					
Free running	4, 5, 6, 14	7, 8, 9, 12	None	10, 11, 13	$t_A(10, 11) = 4.40 RC$
True gating	4, 6, 14	7, 8, 9, 12	5	10, 11, 13	} $t_A(13) = 2.20 RC$
Complement gating	6, 14	5, 7, 8, 9, 12	4	10, 11, 13	
Monostable multivibrator					
Positive-edge trigger	4, 14	5, 6, 7, 9, 12	8	10, 11	} $t_M(10, 11) = 2.48 RC$
Negative-edge trigger	4, 8, 14	5, 7, 9, 12	6	10, 11	
Retriggerable	4, 14	5, 6, 7, 9	8, 12	10, 11	
*External countdown	14	5, 6, 7, 8, 9, 12	None	10, 11	
*Input pulse to reset of external counting chip. External counting chip output to terminal 4.					
<u>NOTE:</u> In all cases external resistor between terminals 2 and 3 and external capacitor between terminals 1 and 3.					



TP5-2268-011

Exclusive OR Gate, 351-8159-190
Figure 5

3.2 Testing

The test procedures in table 3 check total performance of the control card. These test procedures per-

mit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

Table 3. Control, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit containing control that is to be tested. Caution Make sure PWR switch is turned off and card is not installed backward in following step. Note Front panel control settings (at the beginning of each test) are listed only for those controls whose settings affect the test. Unlisted controls may be set in any position. b. Remove control. Install it on extender card and place it in unit. c. Set unit LINE SELECTOR switch to 115 V. d. Connect unit to 115-V ac power source and set power on. Caution All measurements on P1 pins must be made with extreme care. Shorting 5-volt sources to any CMOS output device will damage the device. e. Measure dc voltages between P1-65 and ground (TP1, brown).	+5 $\pm$ 0.5 V dc	Check 5-V power supply.
2. Frequency outputs (Cont)	Note In this test, four frequencies are selected on the front panel FREQUENCY control. For each frequency, the frequency output line logic levels are measured at the rear panel PRESELECTOR CONTROL connector, J21. To provide collector voltage for the output transistors, a 4700-ohm resistor is placed in series with +5 V dc. The resistor is then sequentially connected to applicable pins of J21 and the logic level at the pins measured. The following chart gives the frequencies, applicable pin numbers, and the correct logic levels.		

Table 3. Control, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE										NORMAL INDICATION					IF INDICATION IS ABNORMAL			
2. (Cont)	a. Sequentially connect a 4700-ohm resistor between each of frequency outputs on J21 and +5 V dc. (+5 V may be obtained at pwr sply TB1-7.) b. Measure voltage at pins and note that logic outputs are indicated in the following chart for each indicated frequency setting.										Logic 1 = +3 to +5 V Logic 0 = 0 to +0.5 V					Refer to figure 6 and check circuit associated with each abnormal output.			
J16 PIN NO	36	17	35	16	34	15	33	14	32	13	31	12	30	11	29	10	28	9	
ASSOCIATED P1 PIN NO	109	44	108	43	107	42	106	41	105	40	104	39	103	38	102	37	101	36	
FREQUENCY (kHz)	BDC (MHz)							BCD (kHz)											
	20	10	8	4	2	1	800	400	200	100	80	40	20	10	8	4	2	1	
29 999.00	1	0	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	
16 666.00	0	1	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	
10 000.00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2 000.00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Logic 1 equals +3.0 to +5.0 V dc. Logic 0 equals 0 to 0.5 V dc.																			
	c. Disconnect 4700-ohm resistor.																		
3. Band decode check	a. Measure voltage at TP4, TP5, and TP3. Note that logic outputs are as indicated in the following chart for each indicated frequency.										Logic 1 = +3 to +5 V Logic 0 = 0 to +0.5 V					Refer to figure 6 and check circuits associated with each abnormal output.			
		FREQUENCY (kHz)					BAND 1 TP4			BAND 2 TP5			BAND 3 TP3						
		29 999.99					1			1			0						
		16 666.66					1			1			0						
		2 000.00					1			1			0						
		1 999.99					1			1			0						
		1 600.00					1			1			0						
		1 599.99					1			0			1						
		0 530.00					1			0			1						
		0 529.99					0			1			1						
		0 000.00					0			1			1						
		Logic 1 equals +3.0 to +5.0 V dc. Logic 0 equals 0 to 0.5 V dc.																	

Table 3. Control, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. Synthesizer, frequency reference, vbfo, and subcarrier faults	a. Temporarily connect +5 V (available at P1-65) to P1-49 (synthesizer fault input). b. Remove connection and temporarily connect +5 V to P1-112 (frequency reference fault input). c. Remove connection and temporarily connect +5 V to P1-5 (vbfo fault input). d. Remove connection and temporarily connect +5 V to P1-4 (subcarrier fault input). e. Measure voltage at P1-78 (rcv fault output). f. Remove +5 V from P1-4. TESTING COMPLETE	RCV FAULT indicator lights. RCV FAULT indicator goes out when ground removed and lights when ground connected. RCV FAULT indicator goes out when ground removed and lights when ground connected. RCV FAULT indicator goes out when ground removed and lights when ground connected. Not less than +3.0 V dc	Proceed to step g. Check U21C. Check U21C. Check U9A. Check U3E and Q23.
	TROUBLESHOOTING g. Measure dc voltage at P1-13.	Not less than +3.0 V dc	Check U21C, U9A, U15A, U19C, and U3A.
5. Power supply fault	a. Temporarily connect +5 V (available at P1-65) to P1-70. b. Remove +5 V from P1-70. c. Change any front panel frequency control. POWER SUPPLY FAULT TESTING COMPLETE	RCV FAULT indicator lights. RCV FAULT indicator remains lit. RCV FAULT indicator goes out.	Proceed to step d. Proceed to step e. Proceed to step g.
	TROUBLESHOOTING d. Measure dc voltage at P1-13. e. Measure dc voltage at U15B-4.	Not less than +3.0 V dc. Not less than +3.0 V dc. Repeat test 5.	Check U12C, U15A, U15B, and U19C. Proceed to step f.

(Cont)

Table 3. Control, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	f. Measure dc voltage at U2A-3.	Not more than +0.5 V dc.	Check U2A, U15B, and U15A.
	g. Measure dc voltage at U15B-5 while changing any front panel frequency control.	Logic 1 pulse, returning to not more than +0.5 V dc after frequency is changed.	Check U2A, Proceed to step h.
	h. Measure dc voltages at following pins while changing any front panel frequency control:		
	P1-16	Not less than +3.0 V dc	Check U2A, U5D, and U3B.
	P1-21	Not more than +0.5 V dc	
	P1-47	Logic 1 pulse, returning to not more than +0.5 V dc after frequency is changed	
6. +5-V dc fault	a. Momentarily ground P1-65.	RCV FAULT indicator lights.	Check +5-V dc circuits.
	b. Immediately remove P1-65 ground.	RCV FAULT indicator remains on.	Check U3F and associated circuits.
	c. Change any front panel frequency control.	RCV fault indicator goes out.	Repeat test 5.
7. Preselector fault	a. Apply +5 V dc to P1-35.	PRESEL FAULT indicator lights.	Proceed to step c.
	b. Remove +5 V dc from P1-35.	PRESEL FAULT indicator goes out.	Proceed to step d.
	PRESELECTOR FAULT TESTING COMPLETE		
	-----	-----	-----
	TROUBLESHOOTING c. Measure dc voltage at P1-71. d. Measure dc voltage at P1-71.	Not less than +3.0 V dc Not more than +0.5 V dc	Check U14A and associated circuit. Check U14A and associated circuit.

Table 3. Control, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. Rf overload	a. Connect +5 V dc to P1-100.	RCV OVERLOAD indicator lights.	Proceed to step g.
	b. Remove +5 V dc from P1-100.	RCV OVERLOAD indicator goes out.	Proceed to step h.
	c. Connect rf signal generator directly to J1 (RCV ANT jack on rear panel).		
	d. Set rf signal generator and receiver front panel controls to 600 kHz.		
	e. Increase rf signal generator output level until receive overload relay just clicks.	RCV OVERLOAD indicator lights.	Proceed to step i.
	f. Remove rf signal generator output.	RCV OVERLOAD indicator goes out.	Proceed to step k.
	RF OVERLOAD TESTING COMPLETE		
	-----	-----	-----
	TROUBLESHOOTING		
	g. Measure dc voltage at P1-68.	Not less than +3.0 V dc	Check U21A, U14E, and associated circuit.
	h. Measure dc voltage at P1-100.	Not more than +0.5 V dc.	Check U21A, U14E, and associated circuit.
	i. Measure dc voltage at P1-12.	Not more than +0.5 V dc.	Check receive rf overload circuits.
	j. Measure dc voltage at P1-68.	Not more than +0.5 V dc.	Check U21A and associated circuit.
	k. Measure dc voltage at P1-12.	Not less than +3.0 V dc.	Check receive rf overload circuit.
9. Tune start	a. Connect 4700-ohm resistor between TP2 and +5 V dc. (Leave connected until test 9 complete.)		
(Cont)	b. Measure output at TP2 while changing front panel frequency controls.	Logic 0 (ground) output pulse whose duration continues as long as frequency controls are constantly changing.	Proceed to step m.
	c. Measure output at TP2 when front panel frequency controls are set.	Not less than +3.0 V dc.	Proceed to step o.
	d. Set front panel CONT switch to REM.		

Table 3. Control, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. (Cont)	e. Measure output at TP2 while changing front panel frequency controls. Note Steps f, g, and h are performed only if unit under test is connected remotely. f. Measure output at TP2 while changing remote control frequency controls. g. Set front panel CONT switch to LCL. h. Measure output at TP2 while changing remote control frequency controls. i. Measure output at U2B-4 while changing remote control frequency controls. j. Remove 4700-ohm resistor from TP2. TUNE START TESTING COMPLETE TROUBLESHOOTING m. Measure input at P1-47 while changing front panel frequency controls. n. Measure output at U9B-4 while changing front panel frequency controls. o. Measure dc voltage at P1-47. p. Measure dc voltage at P1-16.	Not less than +3.0 V dc (local frequency changes locked-out) Logic 0 (ground) output pulse whose duration continues as long as frequency controls are constantly changing. Not less than +3.0 V dc (remote frequency changes locked-out). Logic 0 (ground) output pulse whose duration continues as long as CONT switch is constantly changing.	Proceed to step p. Proceed to step q. Check U3B and U5D. Check U2B and associated circuit. Check local frequency change output circuits. Check U2A and U9B. If pulses are present, check U8 and Q4. Check local frequency change output circuits. Check Q8. Check local enable circuits. If circuits are functioning, check U3B, U5D, and U2A.
(Cont)			

Table 3. Control, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. (Cont)	q. Measure input at P1-21 while changing remote control frequency controls.	Logic 1 input pulse at each switching of remote control frequency controls.	Check remote frequency change input circuits. If circuits are functioning, check U5D and U2A.
10. 450-kHz enable	a. Set front panel MODE switch to ISB. Set all CH switches to OFF.		
	b. Measure output at TP6.	Not less than +3.0 V dc.	Proceed to step e.
	c. Set front panel MODE switch to AM.		
	d. Measure output of TP6.	Not more than +0.5 V dc.	Proceed to step f.
	450-kHz ENABLE TESTING COMPLETE		

	TROUBLESHOOTING		
	e. Measure dc voltage at P1-9.	Not less than +3.0 V dc.	Check ISB enable circuits. Check U20C.
	f. Measure dc voltage at P1-72, -26, and -9.	Not more than +0.5 V dc.	Check ISB, CW, and AM circuits. Check U20C and U20D.
11. A1/CW enable	a. Set front panel MODE switch to CW.		
	b. Measure output at TP8.	Not less than +3.0 V dc.	Proceed to step g.
	c. Set front panel MODE switch to ISB.		
	d. Measure output at TP8.	Not more than +0.5 V dc.	Proceed to step h.
	e. Set CH A1 to ON.		
	f. Measure output at TP8.	Not less than +3.0 V dc.	Proceed to step i.
	A1/CW ENABLE TESTING COMPLETE		

(Cont)	g. Measure dc voltage at P1-72.	Not less than +3.0 V dc.	Check CW enable circuits. Check U20D.
	h. Measure dc voltage at P1-72 and -26.	Not more than +0.5 V dc.	Check CW and A1 enable circuits. Check U20D.

Table 3. Control, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11. (Cont)	i. Measure dc voltage at P1-26.	Not less than +3.0 V dc.	Check CH A1 enable circuits. Check U20D.
12. Subcarrier enable	a. Make sure CH A2 and CH B2 switches are OFF.		
	b. Measure output at TP7.	Not more than +0.5 V dc.	Proceed to step g.
	c. Set CH A2 to ON.		
	d. Measure output at TP7.	Not less than +3.0 V dc.	Proceed to step h.
	e. Set CH A2 to OFF and CH B2 to ON.		
	f. Measure output at TP7.	Not less than +3.0 V dc.	Proceed to step i.
	SUBCARRIER ENABLE TESTING COMPLETE		

	TROUBLESHOOTING		
	g. Measure dc voltage at P1-17 and -74.	Not more than +0.5 V dc.	Check CH A2 and CH B2 enable circuits. If dc voltage at logic 0, check U20B.
	h. Measure dc voltage at P1-17.	Not less than +3.0 V dc.	Check CH A2 enable circuit. Check U20B.
	i. Measure dc voltage at P1-74.	Not less than +3.0 V dc.	Check CH B2 enable circuit. Check U20B.

4. ALIGNMENT/ADJUSTMENT

4.1 AGC Time Constant Delay (Adjustment of R166)

With no signal input to card, adjust R166 to produce +1.85 V at U2-3.

4.2 AGC Meter Full-Scale Deflection (Adjustment of R120)

- Apply 9.449-MHz, 10-mV input to P1.
- Set MODE to ISB, AGC to OFF, CH A1 to ON, and METER to CH A1 +13FS.
- Using RF GAIN, set voltage at P4-21 to $+5 \pm 0.05$ V.
- Adjust R120 to produce $+50 \pm 1$ mV at P4-12. Note that front panel meter is deflected full-scale.

4.3 SSB Audio Output Level (Adjustment of R95)

- Apply 9.449-MHz, 100- μ V input to P1.
- Set MODE to ISB, AGC to ON, CH A1 to ON, and RF GAIN to max cw position.
- Connect 600-ohm resistor and audio voltmeter between P4-34 and ground.
- Adjust R95 to produce 10 mV rms at P4-34.

4.4 AM Audio Output Level (Adjustment of R145)

- Apply 9.449-MHz, 50% AM with 1000-Hz, 100- μ V input to P1.
- Set MODE to AM, BANDWIDTH to 16, AGC to ON, CH A1 to ON, and RF GAIN to max cw position.
- Connect 600-ohm resistor and audio voltmeter between P4-8 and ground.
- Adjust R145 to produce 10 mV rms at P4-34.

4.5 Mixer Balance (Adjustment of R8)

- Disconnect P1 from any signal source.
- Measure 9.9-MHz rf voltage (using high-impedance probe) at P3.
- Adjust R8 to null 9.9-MHz signal at P3.
- Reconnect P1.

4.6 IF Amplifier Alignment (Alignment of T1, T2, L7, L13, C3, and C5)

- Set AGC to OFF, MODE to ISB, CH A1 to ON, and RF GAIN to max cw position.
- Apply 9.4485-MHz input to P1 at level sufficient to produce approximately 25-mV rf at P6.
- Adjust T1, T2, and L13 to obtain peak voltage at P6. (L13 has two adjustment peaks; either may be used.)

- Set sig gen frequency to 10.351 MHz (image frequency).
- Adjust C3 and C5 to null voltage at P6. (Increase sig gen output level as necessary to detect sharp null. Each capacitor has two null positions; either position may be used.)
- Set sig gen to 9.4485 MHz.
- Repeat T1, adjusting sig gen output level as necessary to detect peak.
- Set MODE to AM and BANDWIDTH to 16.
- Adjust L7 for peak voltage at P6.

4.7 IF Amplifier Gain (Adjustment of R19, R39, and R43)

- Apply 9.4485-MHz, 10-mV input to P1.
- Set AGC to OFF, CH A1 to ON, and MODE to ISB.
- Adjust R19 to produce 28 mV rms at P3.
- Measure rf voltage at Q9-d.
- Adjust R39 to obtain 70 mV rf at Q9-d. (Voltage at Q9-d is to be 2.5 times voltage at P3.)
- Set MODE to AM and BANDWIDTH to 16.
- Measure rf voltage at Q9-d.
- Adjust R43 to obtain 70-mV rf at Q9-d. (Voltage at Q9-d is to be 2.5 times voltage at P3.)
- Set AGC to ON and RF GAIN to max cw position.
- Set sig gen output to 100 μ V.
- Adjust R59 to obtain +0.85 V at P4-21.
- Increase sig gen output by 40 dB (to 10 mV).
- Adjust R136 to obtain +5.0 V at P4-21.
- Repeat steps j through m until no further adjustment is necessary.
- Disconnect sig gen from P1.
- Adjust RF GAIN to obtain $+5.00 \pm 0.05$ V at P4-21.
- Adjust R140 to obtain $+3.0 \pm 0.05$ V at P4-18.

5. REPAIR

Repair of the control card is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is

performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 6). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagrams to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

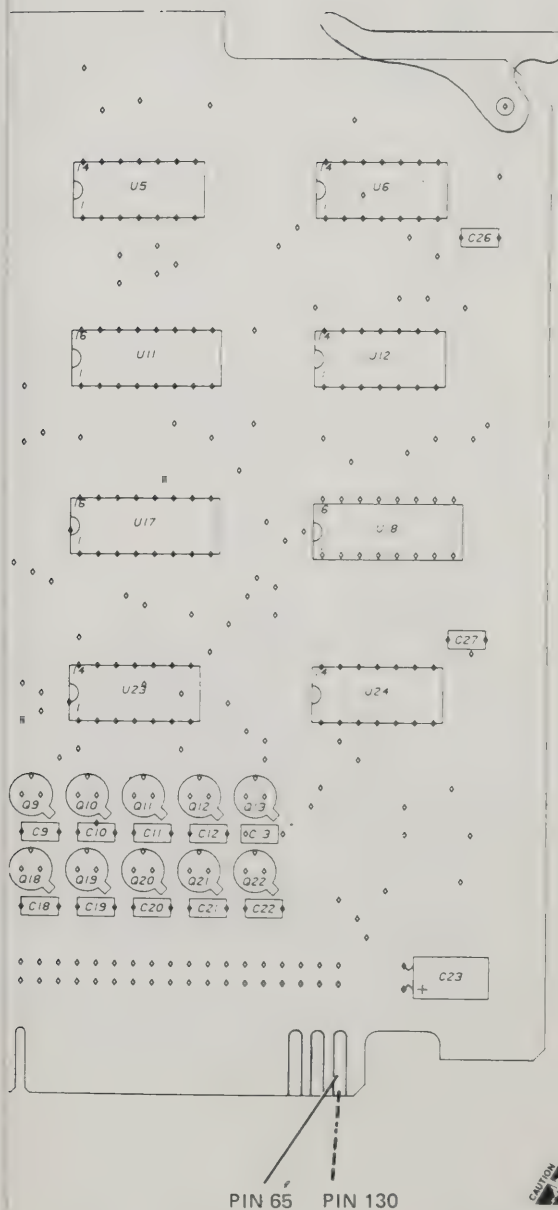
Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
81349	MILITARY SPECIFICATION

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Control	638-6629-001	REV D

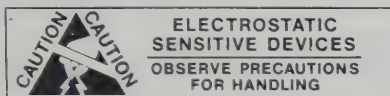


TPA-2507-018

Control, Schematic Diagram
Figure 6 (Sheet 1 of 4)

performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 6). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagrams to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the **DESCRIPTION** column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the **EFFECTIVITY** column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

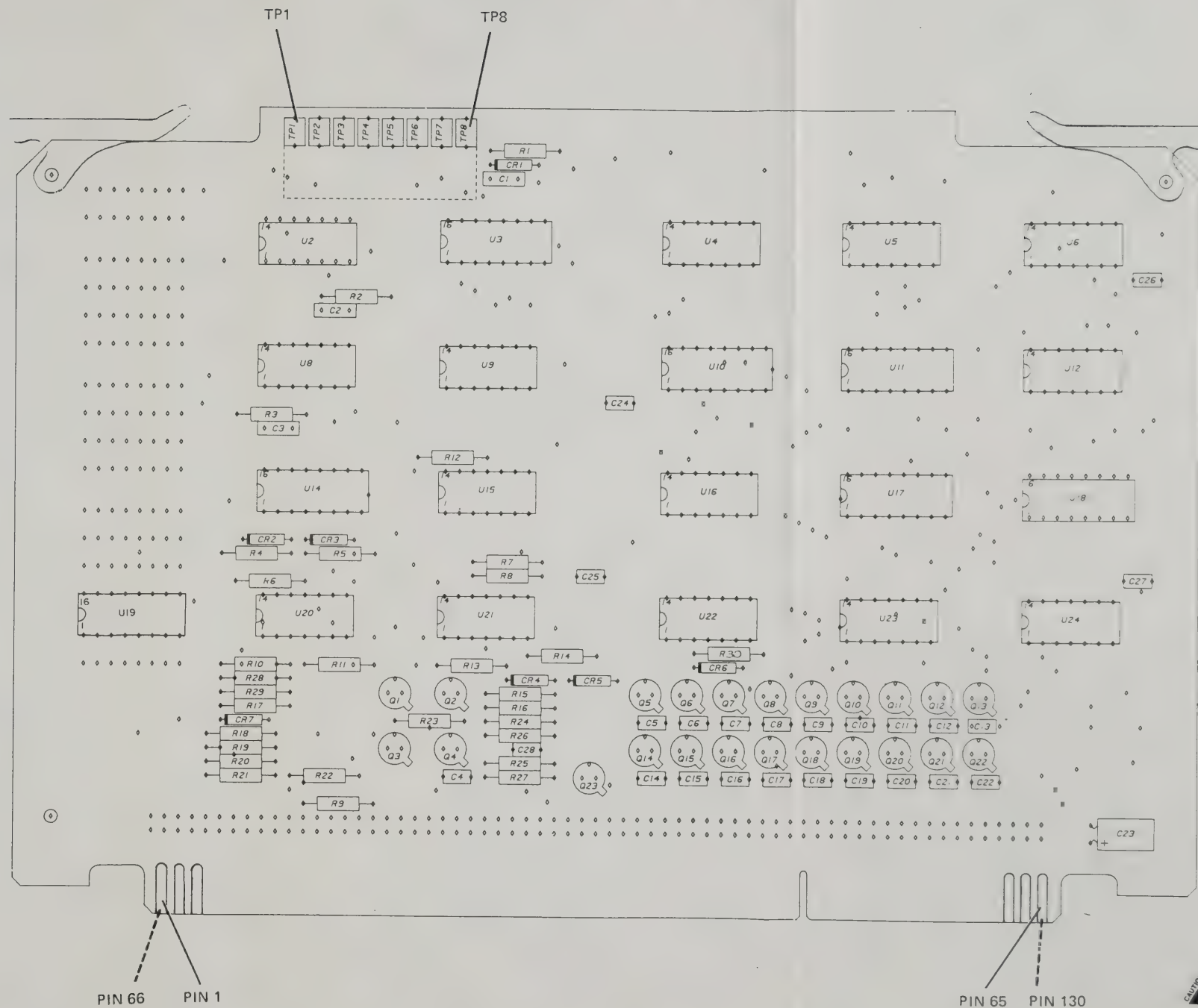
Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
81349	MILITARY SPECIFICATION

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Control	638-6629-001	REV D



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2507-018

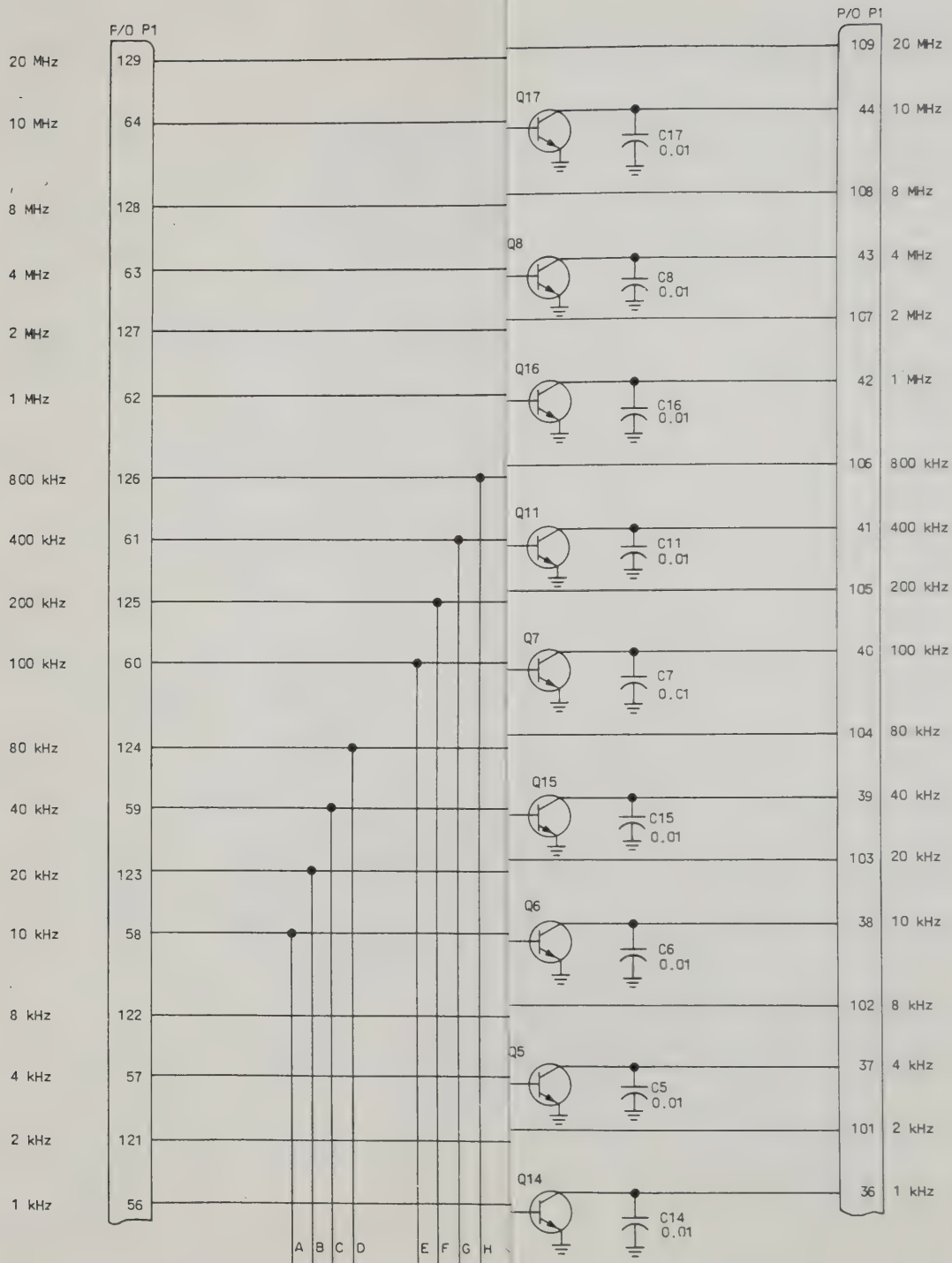
Control, Schematic Diagram
Figure 6 (Sheet 1 of 4)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
	CONTROL (ESDS)	638-6629-001		
CR1-CR7	SEMICOND DEVICE	353-3644-010		03508
C1-C3	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349
C4-C22	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
C23	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289
C24-C28	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349
Q1-Q23	TRANSISTOR	352-0661-020		07263
R1	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349
R2	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349
R3	RESISTOR,FXD CHPSN, 0.56MEGO, 10%, 1/4W	745-0848-000		81349
R4	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R5-R11	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R12,R13	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349
R14	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R15	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R16-R22	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R23,R24	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349
R25	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R26	RESISTOR,FXD CHPSN, 22K, 5%, 1/4W	745-0796-000		81349
R27	RESISTOR,FXD CHPSN, 4.7K, 5%, 1/4W	745-0772-000		81349
R28	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R29	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349
R30	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
TP1	JACK,TIP BRN	360-0484-070		74970
TP2	JACK,TIP RED	360-0484-020		74970
TP3	JACK,TIP ORN	360-0484-050		74970
TP4	JACK,TIP YEL	360-0484-060		74970
TP5	JACK,TIP GRN	360-0484-040		74970
TP6	JACK,TIP BLU	360-0484-080		74970
TP7	JACK,TIP VIO	360-0484-090		74970
TP8	JACK,TIP GRA	360-0484-100		74970
U1	NOT USED			
U2	INTEGRATED CIRCUIT (ESDS)	351-8159-190		07263
U3	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263
U4	INTEGRATED CIRCUIT (ESDS)	351-8159-040		04713
U5	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-030		02735
U6	INTEGRATED CIRCUIT (ESDS)	351-8159-020		04713
U7	NOT USED			
U8	MICROCIRCUIT (ESDS)	351-8200-020		02735
U9	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-010		02735
U10,U11	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263
U12	INTEGRATED CIRCUIT (ESDS)	351-8159-150		04713
U13	NOT USED			
U14	INTEGRATED CIRCUIT (ESDS)	351-8159-220		07263
U15	INTEGRATED CIRCUIT (ESDS)	351-8159-020		04713
U16	RESISTOR NTWK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-090		01121
U17	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263
U18	RESISTOR NETWORK 220K, 5%, 1.25W PKG	350-4030-010		01121
U19	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-030		02735
U20	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-010		02735
U21	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-050		02735
U22,U23	RESISTOR NTWK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-090		01121
U24	RESISTOR NTWK DUAL-IN-LINE, 100K, 2%, 125V	350-4027-140		01121

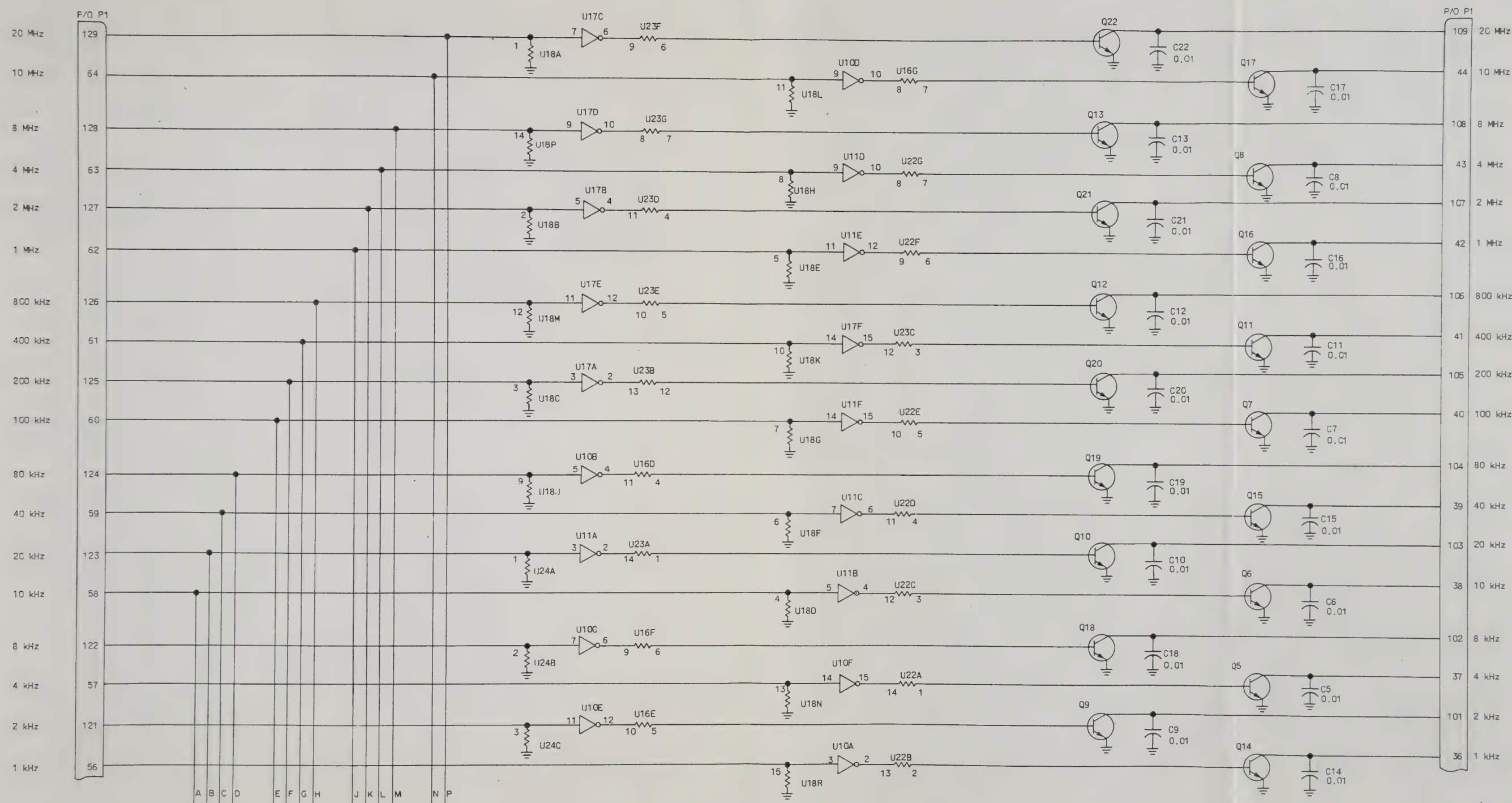
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	CONTROL (ESDS)	638-6629-001			
CR1-CR7	SEMICONO DEVICE	353-3644-010		03508	1N4454GE
C1-C3	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C4-C22	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C23	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289	1990226X0010CB1
C24-C28	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
Q1-Q23	TRANSISTOR	352-0661-020		07263	2N222A
R1	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS
R2	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R3	RESISTOR,FXD CHPSN, 0.56MEGO, 10%, 1/4W	745-0848-000		81349	RCR07G564KS
R4	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R5-R11	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R12,R13	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R14	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R15	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R16-R22	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R23,R24	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R25	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R26	RESISTOR,FXD CHPSN, 22K, 5%, 1/4W	745-0796-000		81349	RCR07G223JS
R27	RESISTOR,FXD CHPSN, 4.7K, 5%, 1/4W	745-0772-000		81349	RCR07G472JS
R28	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R29	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R30	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
TP3	JACK,TIP ORN	360-0484-050		74970	105-1106-011
TP4	JACK,TIP YEL	360-0484-060		74970	105-1107-011
TP5	JACK,TIP GRN	360-0484-040		74970	105-1104-011
TP6	JACK,TIP BLU	360-0484-080		74970	105-1110-011
TP7	JACK,TIP VIO	360-0484-090		74970	105-1112-011
TP8	JACK,TIP GRA	360-0484-100		74970	105-1113-011
U1	NOT USED				
U2	INTEGRATED CIRCUIT (ESDS)	351-8159-190		07263	4030BPC
U3	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049BPC
U4	INTEGRATED CIRCUIT (ESDS)	351-8159-040		04713	MC14011UBCP
U5	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-030		02735	CD4081BE
U6	INTEGRATED CIRCUIT (ESDS)	351-8159-020		04713	MC14001UBCP
U7	NOT USED				
U8	MICROCIRCUIT (ESDS)	351-8200-020		02735	CD4047BE
U9	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-010		02735	CD4071BE
U10,U11	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049BPC
U12	INTEGRATED CIRCUIT (ESDS)	351-8159-150		04713	MC14025UBCP
U13	NOT USED				
U14	INTEGRATED CIRCUIT (ESDS)	351-8159-220		07263	4050BPC
U15	INTEGRATED CIRCUIT (ESDS)	351-8159-020		04713	MC14001UBCP
U16	RESISTOR NTWK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-090		01121	314B103
U17	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049BPC
U18	RESISTOR NETWORK 220K, 5%, 1.25W PKG	350-4030-010		01121	314A224
U19	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-030		02735	CD4081BE
U20	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-010		02735	CD4071BE
U21	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-050		02735	CD4075BE
U22,U23	RESISTOR NTWK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-090		01121	314B103
U24	RESISTOR NTWK DUAL-IN-LINE, 100K, 2%, 125V	350-4027-140		01121	314A104



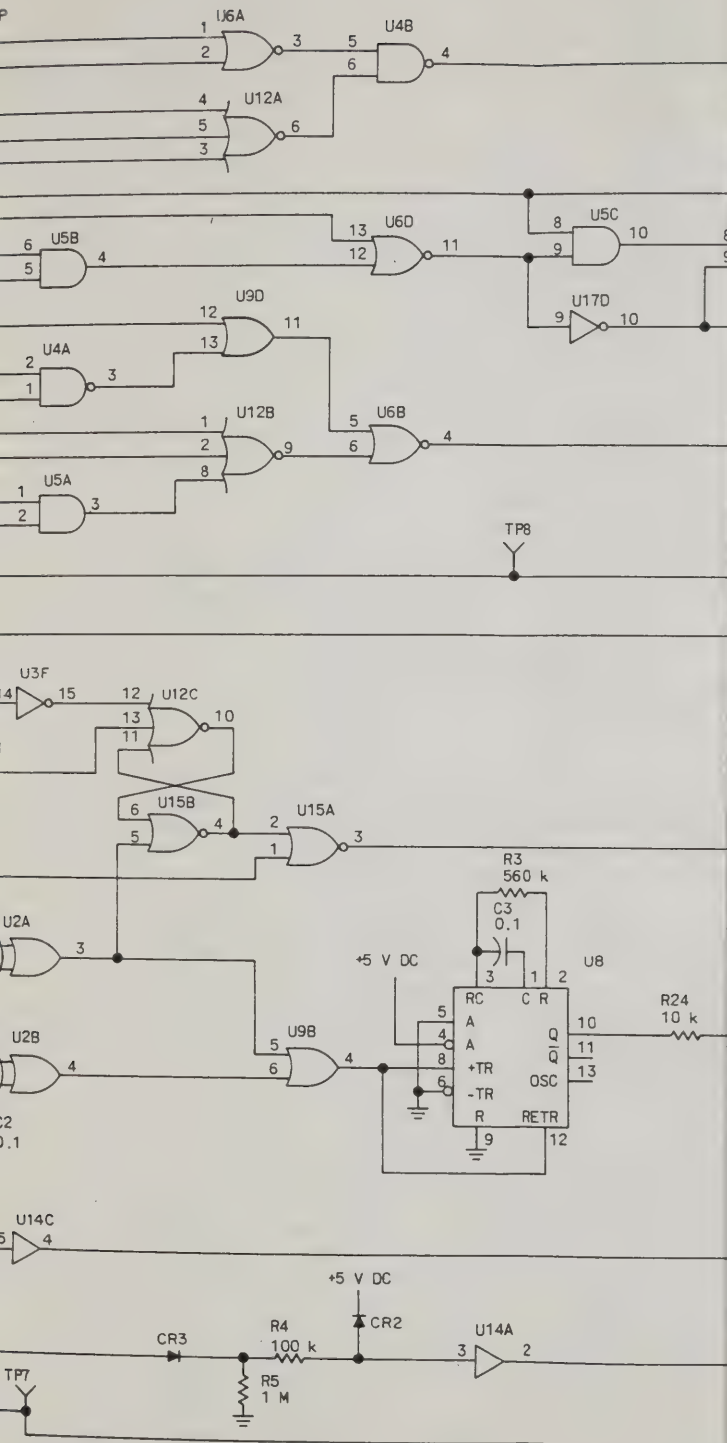
634-6698 SH 1

Control, Schematic Diagram
Figure 6 (Sheet 3)



634-6698 SH 1

Control, Schematic Diagram
Figure 6 (Sheet 3)

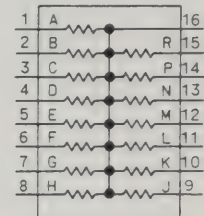
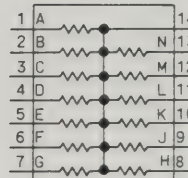


RESISTANCE VALUES ARE IN OHMS,
CAPACITANCE VALUES ARE IN MICROFARADS, TRANSISTORS ARE
AND DIODES ARE TYPE 1N4454.

UNIT DESIGNATIONS ARE SHOWN; FOR COMPLETE
CIRCUIT REFERENCE WITH UNIT AND/OR ASSEMBLY DESIGNATION.

U24-100 k

U18-220 k



CONTAINS ELECTROSTATIC DISCHARGE
SENSITIVE DEVICES. SPECIAL HANDLING METHODS AND
PRECAUTIONS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

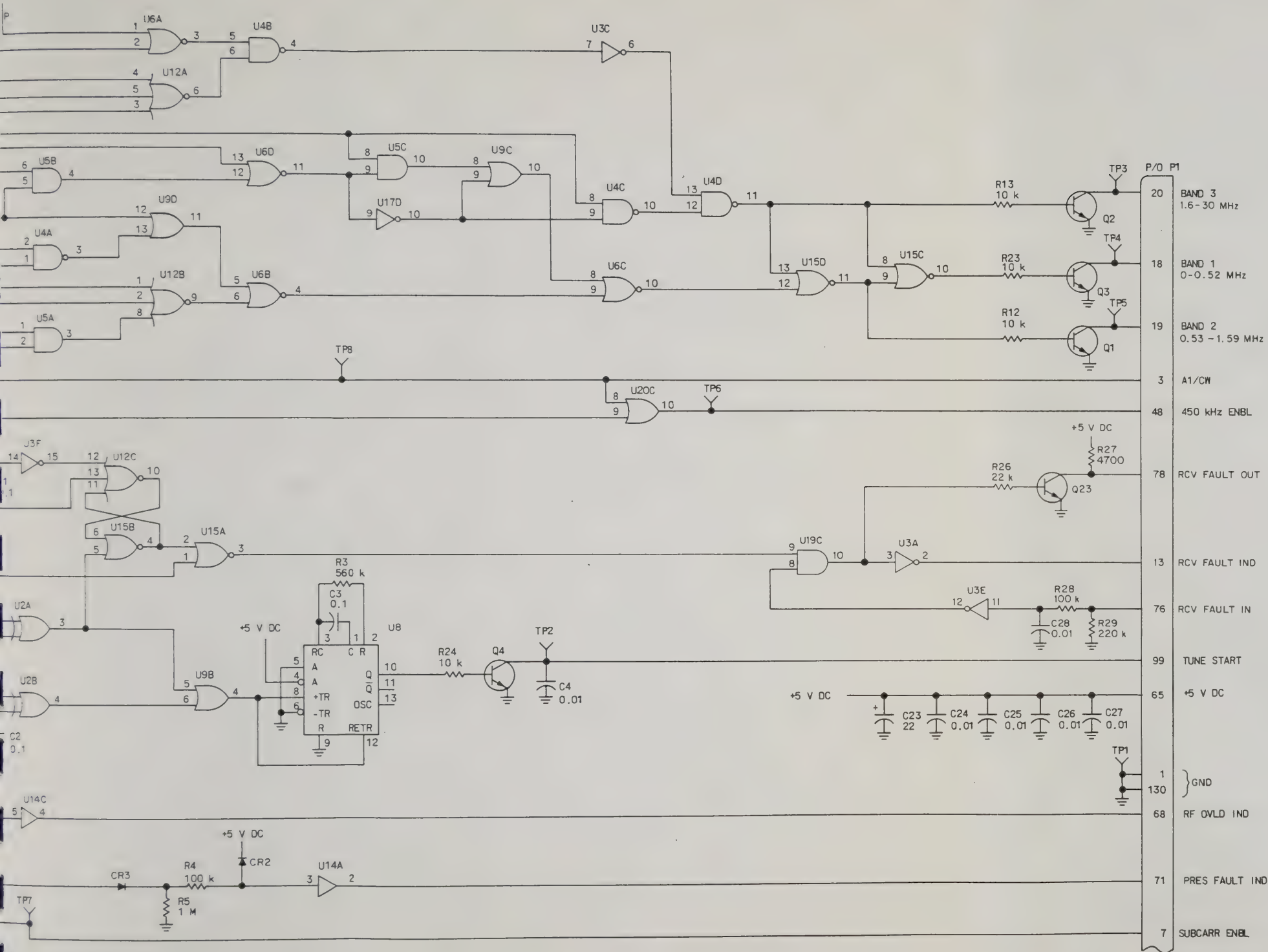
DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND
DIMENSIONS ONLY. SEE APPLICABLE PARTS LIST
FOR PARTS.

FUNCTION

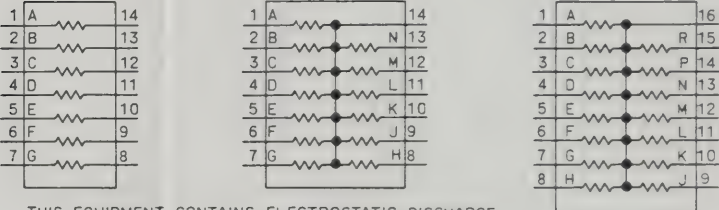
PWR (V DC)		SPARE SECTIONS
+5	GND	
14	7	C, D
1	8	
14	7	
14	7	
14	7	
14	7	
14	7	
1	8	
1	8	
14	7	
1	8	B, C, D, E, F
14	7	A, B, C
1	8	
16		
14	7	A, B, D
14	7	A
14	7	B
14	7	
14	7	D, N

634-6698 SH 2

Control, Schematic Diagram
Figure 6 (Sheet 4)



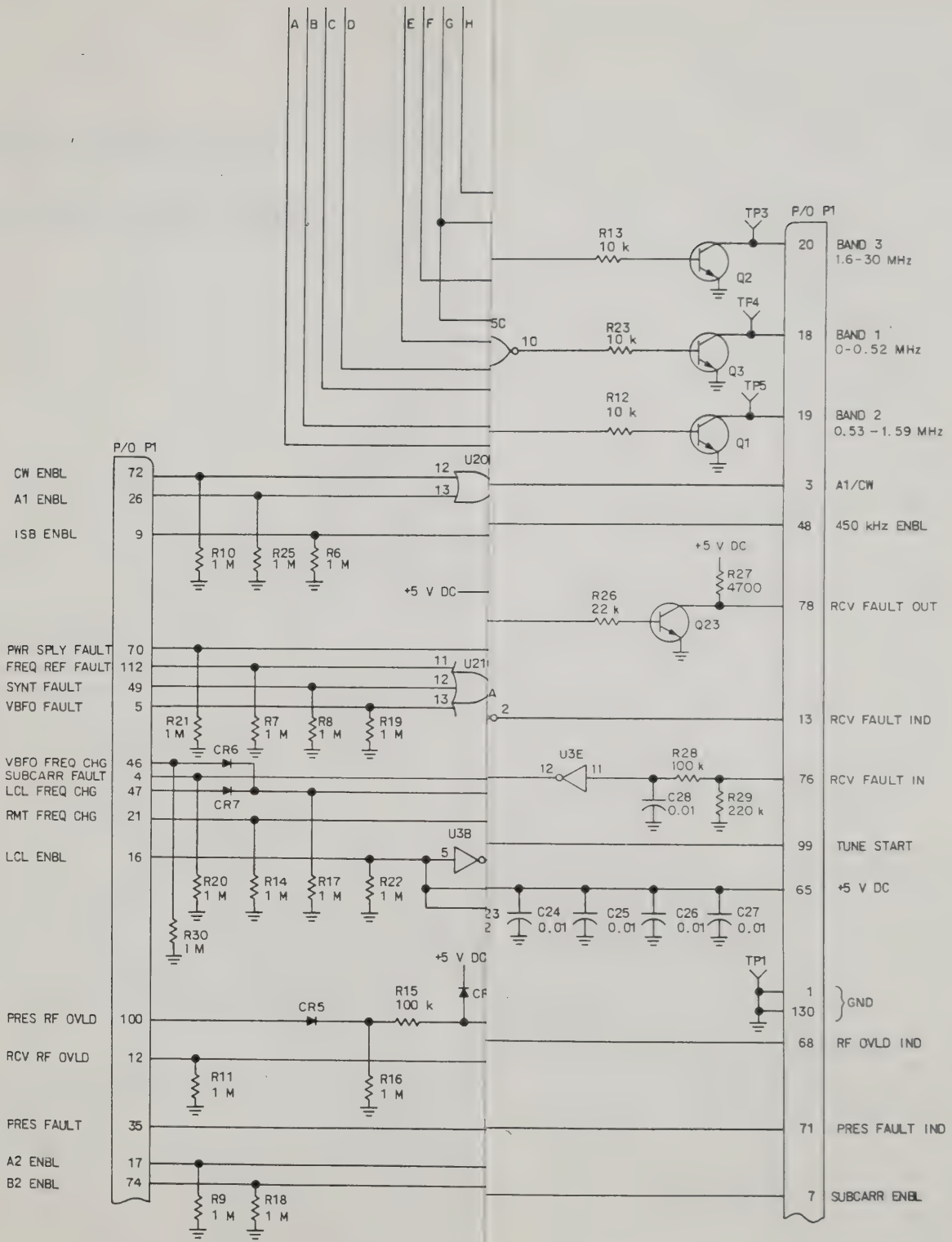
- NOTES:
1. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS. TRANSISTORS ARE TYPE 2N2222A AND DIODES ARE TYPE 1N4454.
 2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
 3. U16, U22, U23-10 k U24-100 k U18-220 k

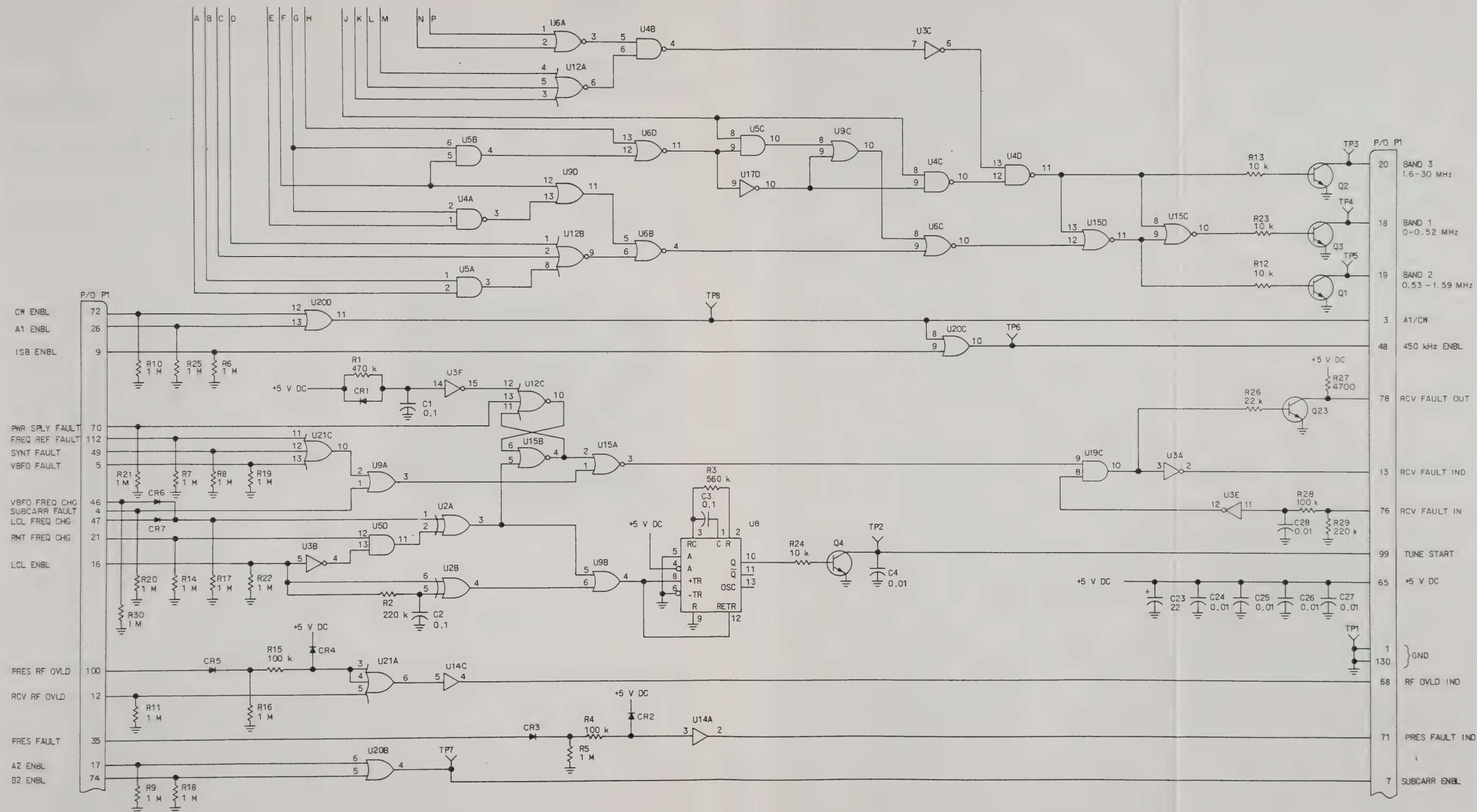


4. THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
5. TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.

MICROCIRCUIT INFORMATION				
U NO.	TYPE	PWR (V DC)		SPARE SECTIONS
		+5	GND	
U1	SPARE			
U2	F4030PC	14	7	C, D
U3	F4049PC	1	8	
U4	F4011UBPC	14	7	
U5	CD4081BE	14	7	
U6	F4001UBPC	14	7	
U7	SPARE			
U8	CD4047AE	14	7	
U9	CD4071BE	14	7	
U10	F4049PC	1	8	
U11	F4049PC	1	8	
U12	F4025UBPC	14	7	
U13	SPARE			
U14	F4050PC	1	8	B, C, D, E, F
U15	F4001UBPC	14	7	
U16	NOTE 3			A, B, C
U17	F4049PC	1	8	
U18	NOTE 3			16
U19	CD4081BE	14	7	A, B, D
U20	CD4071BE	14	7	A
U21	CD4075	14	7	B
U22	NOTE 3			
U23	NOTE 3			
U24	NOTE 3		14	D, N

Control, Schematic Diagram
Figure 6 (Sheet 4)







Rockwell
International

instructions

Parallel Input (642-3135-001)

Collins Telecommunications Products Division

523-0770711-001211

1 January 1981

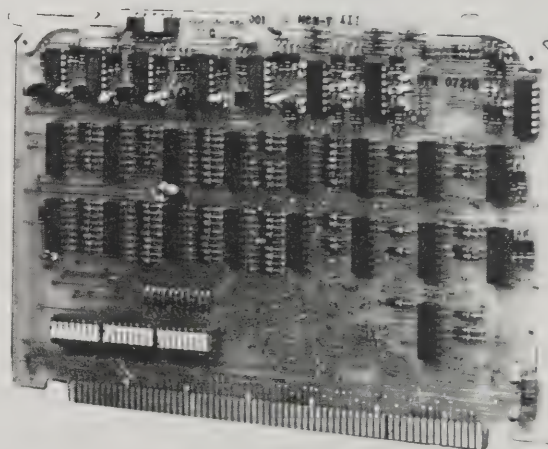
Printed in USA

Parallel Input
(642-3135-001)

1. DESCRIPTION

Parallel Input 642-3135-001, shown in figure 1, is a 2-layer planar card with a 130-pin (2 layers, 65 pins each) edge-on connector. All test points are mounted at the top edge of the card for easy access with the card installed in the unit.

The parallel input card consists of sixteen 8-channel data selectors (multiplexers), ten multivibrators (gate generators), and three 8-section dip switches.



TPA-2840-017

2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 2.)

The parallel input card is designed for use in HF-80 four-channel and two-channel equipment. Dip switches S1, S2, and S3 are placed on the card to permit selection of the desired configuration.

The parallel input card consists of two primary circuits: the 8-channel data selectors and the gate generators. Each data selector receives up to eight inputs developed by the unit front-panel controls and monitor circuits. Address bits, from the serial interface card, select individual inputs for transfer to the single output from the data selectors. These address bits are developed from word gate signals produced by the multivibrator circuits when the card is configured for two-channel equipment. When the card is configured for four-channel equipment, the address bits are generated on the serial interface card.

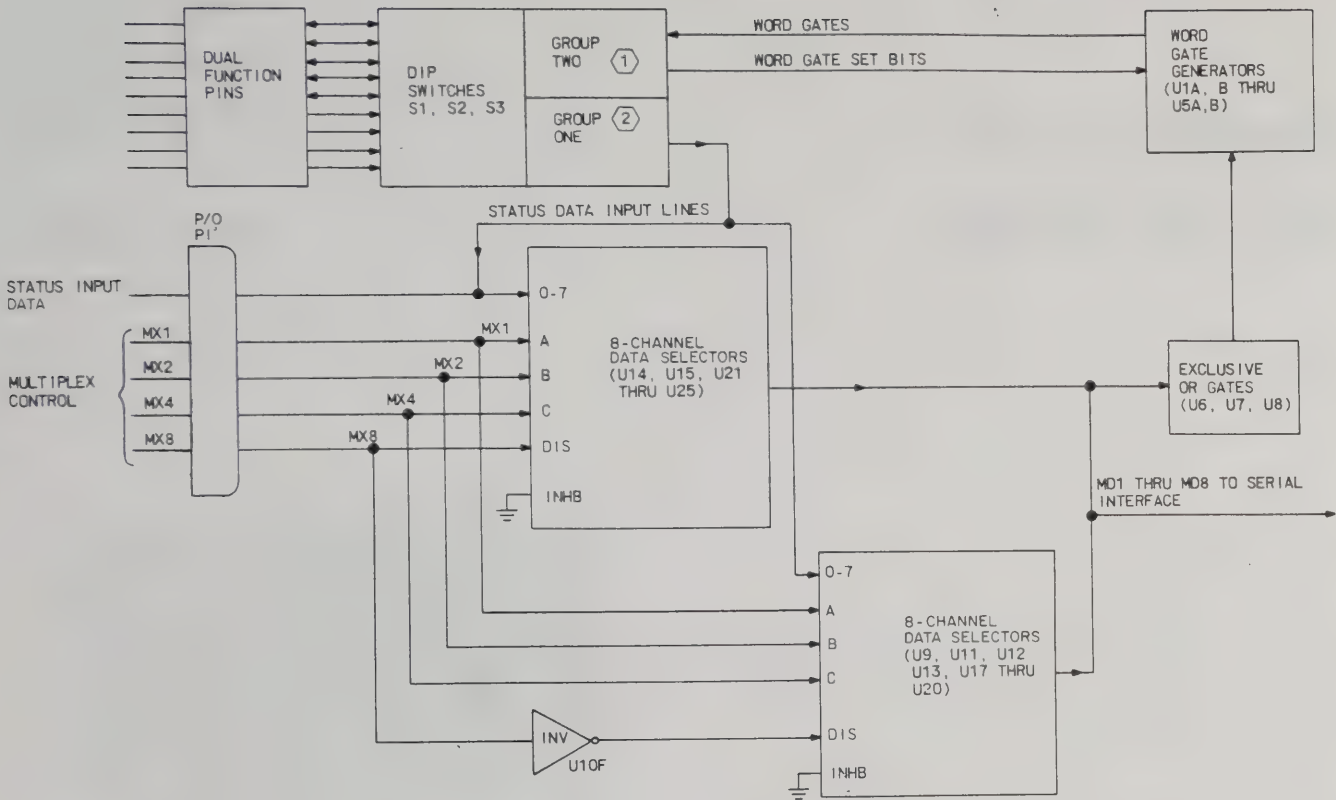
Parallel Input
Figure 1

2.2 Multiplexers (Refer to figure 2 and figure 3, the schematic diagram.)

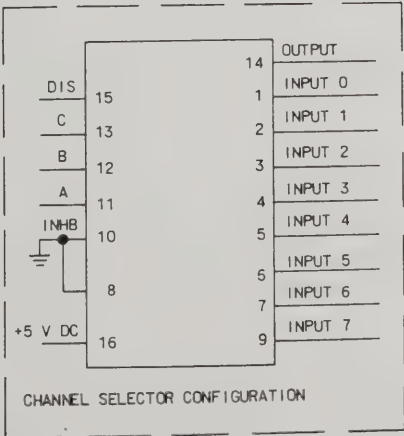
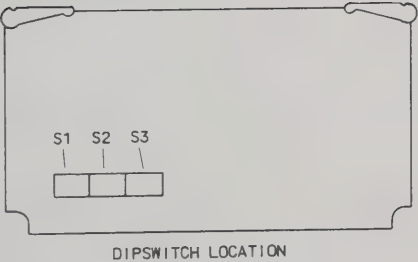
The multiplexers are integrated circuits functioning as 8-channel data selectors. (Refer to table 1 for a truth table of the data selector.) The circuit arrangement is two sections of eight multiplexers each. The MX8 input selects the active section. When at a logic 1 level, the disable input to a multiplexer keeps its output at a high impedance. A logic 0 disable input permits an output to be transferred from one of the eight input lines. MUX 8 is connected to the disable inputs of the first section and inverted by U10F and applied to the disable inputs of the second section to ensure one section is always disabled while the other is enabled.

The MX1, MX2, and MX4 inputs, applied simultaneously to all multiplexers, control which of

523-0770711-001211



- NOTES:
- 1 GROUP TWO (S2, SWITCHES 2 THRU 8 AND S3, SWITCHES 1 THRU 8) CLOSED FOR 2-CHANNEL EQUIPMENT. GROUP ONE OPEN.
 - 2 GROUP ONE (S1, SWITCHES 1 THRU 8, AND S2, SWITCH 1) CLOSED FOR 4-CHANNEL EQUIPMENT. GROUP TWO OPEN.



Parallel Input, Block Diagram
Figure 2

the eight input signals (0-7) to each multiplexer is transferred to the output line. (Refer to the truth table of table 1.) The resulting output signals from the eight multiplexers are the eight data bits (MD1 through MD8) of the control word for the unit under control. These data bits are coupled to the serial interface card for parallel-to-serial conversion, word formation, ASCII or 8-bit formatting, and application to the control bus.

2.3 Gate Generators (Refer to figure 2 and figure 3, the schematic diagram.)

When the parallel input card is configured for two-channel equipment and a front-panel control is switched to a different position, a gate signal is developed by one of five gate generators. Each of these generator circuits is two multivibrators connected in series, that develop a single output pulse. The output is a word or address gate signal, determined by the inputs to the exclusive OR gates, and applied to the serial interface card.

An input pulse to the first multivibrator causes an output pulse from that multivibrator of about 0.1-second width which is the input to the second multivibrator. The second circuit does not trigger until the end (1-to-0 transition) of the first output pulse. This delay gives time for switch settling into the final position selected.

The output from the second multivibrator is a 0.1-millisecond pulse for the word gates and a 10-microsecond pulse for the address gate.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the parallel input card are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in tables 2 and 3 check the total performance of the parallel input card. The

procedures in table 2 are for the following equipments:

HF-8010/8010A Exciter
 HF-8050/8050A Receiver
 HF-8070/8070A Receiver-Exciter
 851S Receiver
 HF-8090, HF-8091, HF-8092, and HF-8095 Controls.

The procedures in table 3 are for the following equipments:

HF-8014/8014A Exciter
 HF-8054/8054A Receiver
 HF-8093 and HF-8094 Controls.

These procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic diagram to trace the source of the fault.

Table 1. 8-Channel Data Selector Truth Table.

C	B	A	INHIBIT	DISABLE	OUTPUT
0	0	0	0	0	X0
0	0	1	0	0	X1
0	1	0	0	0	X2
0	1	1	0	0	X3
1	0	0	0	0	X4
1	0	1	0	0	X5
1	1	0	0	0	X6
1	1	1	0	0	X7
M	M	M	1	0	0
M	M	M	M	1	HIGH IMPED- ANCE
X = transfer to output					
M = don't care					

Table 2. Parallel Input, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup (Cont)	Note The testing and troubleshooting procedures herein are for 1- or 2-channel configurations of the HF-8010/8010A, HF-8050/8050A, HF-8070/8070A, 851S, HF-8090, HF-8091, HF-8092, and HF-8095. These testing and troubleshooting procedures are based on using a control unit and an associated local unit. The most effective method of testing and troubleshooting is obtained by installing the questionable parallel input in the control unit. During these tests when a control unit is referred to it is a receiver-exciter control, an exciter control, or a receiver control. When a local unit is referred to it is a receiver-exciter, an exciter, or a receiver. a. Remove top cover of unit containing parallel input to be tested. b. Remove parallel input. c. Set the dip switches for two-channel operation. (Group 1 open, group 2 closed). Refer to figure 2 for dip switch location. d. Place the parallel input card on the card extender and place it in the unit. e. Set control unit and local unit LINE SELECTOR switches to 115 V.		

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. (Cont)	f. Connect control unit and local unit to 115-V ac power source and set power on. g. Measure dc voltages, on the card under test, between the following pins and ground (TP1, brown): P1-45 P1-65 P1-114 h. Strap local unit for address 0. i. Connect local unit to control unit.	+15 $\pm$1.0 V dc. +5 $\pm$0.5 V dc. -15 $\pm$1.0 V dc.	
2. Word and address gates	a. Connect oscilloscope to TP2 (red). b. Set control unit KEY switch to LOCK and note oscilloscope. c. Set control unit KEY switch to NORM and note oscilloscope. d. Connect oscilloscope to TP3 (orange). e. Set control unit PA PWR switch to STBY and note oscilloscope. f. Set control unit PA PWR switch to OFF and note oscilloscope. g. Connect oscilloscope to TP 4 (yellow). h. Rotate each control unit FREQUENCY KHZ thumb wheel and note oscilloscope when changing positions. i. Connect oscilloscope to TP5 (green). j. Set control unit MODE switch to each mode position and note oscilloscope when changing positions.	A logic level 1, 100-μs (nominal) pulse. Same as step b. A logic level 1, 100-μs (nominal) pulse. Same as step e. A logic level 1, 100-μs (nominal) pulse. A logic level 1, 100-μs (nominal) pulse.	Check U2A, U2B, U8D, and associated circuit. Same as step b. Check U3A, U3B, U10A, S3, and associated circuit. Same as step e. Check U1A, U1B, S2 and associated circuit. Check U5A, U5B, U6, U7, U10C, S3, and associated circuit.
(Cont)			

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	k. Connect oscilloscope to P1-88. l. Rotate control unit ADDRESS switch and note oscilloscope when changing positions. m. Connect +5-V dc input to P1-66. n. Check voltage levels at: TP2 TP3 TP4 TP5 o. Remove +5 V dc from P1-66.	A logic level 1, 100-μs (nominal) pulse. NLT +4.0 V dc. NLT +4.0 V dc. NLT +4.0 V dc. NLT +4.0 V dc.	Check U4A, U4B, S3 and associated circuit. Check CR1. Check CR2. Check CR4. Check CR3.

Note

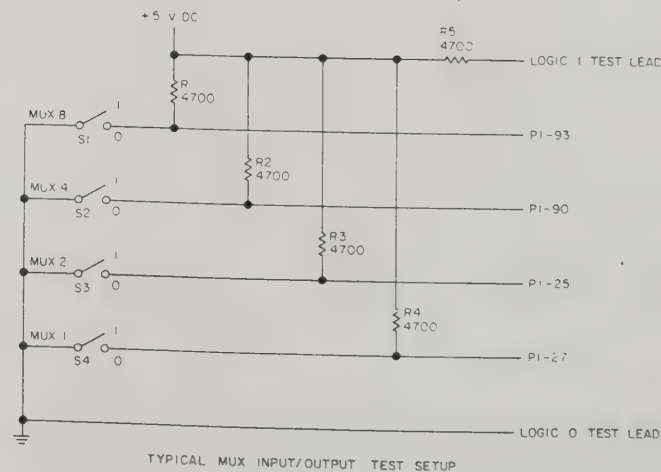
Tests 3 through 18 are output tests. During all of these tests serial interface card A13 is removed from unit under test and mux inputs are strapped according to word and character being tested. To strap a logic 1 input, connect a 4700- Ω resistor in series between the mux input pin and +5 V dc. To strap a logic 0 input, connect directly from the mux input pin to ground. See following chart and figure for mux input/output strapping and setup requirements. Where front-panel controls are shown, these controls may be used to apply the appropriate inputs. If they are not used their associated front-panel connector must be disconnected.

MUX CONTROL LINES INPUT STRAPPING				*OUTPUTS PRESENTED BY PARALLEL INPUT CARD									
				WORD NO	CHARACTER NO	OUTPUT BIT NO							
MX8	MX4	MX2	MX1			1	2	3	4	5	6	7	8
P1-93	P1-90	P1-25	P1-27			P1-26	P1-28	P1-29	P1-94	P1-30	P1-31	P1-96	P1-104
0	0	0	0	1	2	P1-62	P1-127	P1-63	P1-128	P1-64	P1-129	P1-38	P1-103
0	0	0	1	1	3	P1-58	P1-123	P1-59	P1-124	P1-60	P1-125	P1-61	P1-126
0	0	1	0	1	4	P1-54	P1-119	P1-55	P1-120	P1-56	P1-121	P1-57	P1-122
0	0	1	1	1	5	P1-50	P1-115	P1-51	P1-116	P1-52	P1-117	P1-53	P1-118
0	1	0	0	2	2	P1-87	P1-10	P1-75	P1-11	P1-76	NA	NA	NA
0	1	0	1	2	3	P1-20	P1-19	P1-85	P1-84	P1-37	P1-106	P1-41	NA
*Outputs presented at the bit no pins are the inputs at the bit no pins associated with the word no/character no.													

(Cont)

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST				PROCEDURE		NORMAL INDICATION		IF INDICATION IS ABNORMAL					
2. (Cont)													
MUX CONTROL LINES INPUT STRAPPING				*OUTPUTS PRESENTED BY PARALLEL INPUT CARD									
				WORD NO	CHARACTER NO	OUTPUT BIT NO							
						1	2	3	4	5	6	7	8
MX8	MX4	MX2	MX1			P1-26	P1-28	P1-29	P1-94	P1-30	P1-31	P1-96	P1-104
P1-93	P1-90	P1-25	P1-27										
0	1	1	0	2	4	P1-32	P1-97	P1-33	P1-98	P1-34	P1-35	P1-99	P1-100
0	1	1	1	2	5	P1-21	P1-91	P1-92	P1-74	P1-9	P1-72	P1-8	P1-73
1	0	0	0	3	2	P1-112	P1-47	P1-113	P1-48	P1-107	NA	NA	NA
1	0	0	1	3	3	P1-42	P1-108	P1-43	P1-109	P1-44	P1-110	P1-111	P1-46
1	0	1	0	3	4	NA	NA	NA	NA	NA	NA	NA	NA
1	0	1	1	3	5	P1-79	P1-14	P1-78	P1-82	P1-81	NA	NA	NA
1	1	0	0	4	2	NA	NA	NA	NA	P1-68	NA	NA	NA
1	1	0	1	4	3	P1-18	P1-101	P1-39	P1-83	P1-36	P1-105	P1-40	P1-2
1	1	1	0	4	4	P1-3	P1-86	P1-49	P1-67	P1-70	P1-5	P1-4	P1-69
1	1	1	1	4	5	P1-80	P1-16	P1-95	P1-71	NA	NA	NA	NA
*Outputs presented at the bit no pins are the inputs at the bit no pins associated with the word no/character no.													



TP5-4247-013

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																										
3. Word 1, character 2 outputs	a. Strap mux control lines for word 1, character 2.	Verify that associated outputs are at logic 1.																																											
	b. Apply logic 1 inputs at inputs associated with word 1, character 2 (see chart).																																												
	Note FREQUENCY KHZ switches apply logic 1 inputs in the positions indicated in the chart. In the 0 position these switches apply logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 1, character 2 (see chart).			Verify that associated outputs are at logic 0.																																									
<table><tr><th>FRONT-PANEL CONTROL</th><th>BIT NO</th><th>INPUTS P1-()</th><th>OUTPUTS P1-()</th><th>IF ABNORMAL CHECK</th></tr><tr><td rowspan="4">1 MHz</td><td>1</td><td>62</td><td>26</td><td>U25, U18</td></tr><tr><td>2</td><td>127</td><td>28</td><td>U15, U19</td></tr><tr><td>4</td><td>63</td><td>29</td><td>U23, U20</td></tr><tr><td>8</td><td>128</td><td>94</td><td>U21, U17</td></tr><tr><td rowspan="2">10 MHz</td><td>1</td><td>64</td><td>30</td><td>U24, U11</td></tr><tr><td>2</td><td>129</td><td>31</td><td>U16, U13</td></tr><tr><td>NA</td><td>7</td><td>38</td><td>96</td><td>U22, U12</td></tr><tr><td>NA</td><td>8</td><td>103</td><td>104</td><td>U14, R42, U9</td></tr></table>		FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK	1 MHz	1	62	26	U25, U18	2	127	28	U15, U19	4	63	29	U23, U20	8	128	94	U21, U17	10 MHz	1	64	30	U24, U11	2	129	31	U16, U13	NA	7	38	96	U22, U12	NA	8	103	104	U14, R42, U9			
FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK																																									
1 MHz	1	62	26	U25, U18																																									
	2	127	28	U15, U19																																									
	4	63	29	U23, U20																																									
	8	128	94	U21, U17																																									
10 MHz	1	64	30	U24, U11																																									
	2	129	31	U16, U13																																									
NA	7	38	96	U22, U12																																									
NA	8	103	104	U14, R42, U9																																									
4. Word 1, character 3 outputs	a. Strap mux control lines for word 1, character 3.	Verify that associated outputs are at logic 1.																																											
	b. Apply logic 1 inputs at inputs associated with word 1, character 3 (see chart).																																												
	Note FREQUENCY KHZ switches apply logic 1 inputs in the positions indicated in the chart. In the 0 position, these switches apply logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 1, character 3 (see chart).			Verify that associated outputs are at logic 0.																																									
(Cont)																																													

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. (Cont)	FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	10 kHz	1	58	26	U25, U18
		2	123	28	U15, U19
		3	59	29	U23, U20
		4	124	94	U21, U17
	100 kHz	5	60	30	U24, U11
		6	125	31	U16, U13
		7	61	96	U22, U12
		8	126	104	U14, U9
5. Word 1, character 4 outputs	a. Strap mux control lines for word 1, character 4. b. Apply logic 1 inputs at inputs associated with word 1, character 4 (see chart). Note FREQUENCY KHZ switches apply logic 1 inputs in the positions indicated in the chart. In the 0 position, these switches apply logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 1, character 4 (see chart).			Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	
	FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	100 Hz	1	54	26	U25, U18
		2	119	28	U15, U19
		3	55	29	U23, U20
		4	120	94	U21, U17
	1 kHz	5	56	30	U24, U11
		6	121	31	U16, U13
		7	57	96	U22, U12
		8	122	104	U14, U9

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																								
6. Word 1, character 5 outputs	a. Strap mux control lines for word 1, character 5.	Verify that associated outputs are at logic 1.																																									
	b. Apply logic 1 inputs at inputs associated with word 1, character 5 (see chart).																																										
	Note FREQUENCY KHZ switches apply logic 1 inputs in the positions indicated in the chart. In the 0 position, these switches apply logic 0 inputs.		Verify that associated outputs are at logic 0.																																								
	c. Apply logic 0 inputs at inputs associated with word 1, character 5 (see chart).																																										
	<table><tr><th>FRONT-PANEL CONTROL</th><th>BIT NO</th><th>INPUTS P1-()</th><th>OUTPUTS P1-()</th><th>IF ABNORMAL CHECK</th></tr><tr><td>NA</td><td>1</td><td>50</td><td>26</td><td>U25, R68, U18</td></tr><tr><td>NA</td><td>2</td><td>115</td><td>28</td><td>U15, R64, U19</td></tr><tr><td>NA</td><td>3</td><td>51</td><td>29</td><td>U23, R60, U20</td></tr><tr><td>NA</td><td>4</td><td>116</td><td>94</td><td>U21, R56, U17</td></tr><tr><td rowspan="4">*10 Hz</td><td>1</td><td>52</td><td>30</td><td>U24, R52, U11</td></tr><tr><td>2</td><td>117</td><td>31</td><td>U16, R49, U13</td></tr><tr><td>4</td><td>53</td><td>96</td><td>U22, R46, U12</td></tr><tr><td>8</td><td>118</td><td>104</td><td>U14, R43, U9</td></tr></table>				FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK	NA	1	50	26	U25, R68, U18	NA	2	115	28	U15, R64, U19	NA	3	51	29	U23, R60, U20	NA	4	116	94	U21, R56, U17	*10 Hz	1	52	30	U24, R52, U11	2	117	31	U16, R49, U13	4	53	96	U22, R46, U12	8
FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK																																							
NA	1	50	26	U25, R68, U18																																							
NA	2	115	28	U15, R64, U19																																							
NA	3	51	29	U23, R60, U20																																							
NA	4	116	94	U21, R56, U17																																							
*10 Hz	1	52	30	U24, R52, U11																																							
	2	117	31	U16, R49, U13																																							
	4	53	96	U22, R46, U12																																							
	8	118	104	U14, R43, U9																																							
*Applicable only with 10-Hz front-panel tuning.																																											
7. Word 2, character 2 outputs	a. Strap mux control lines for word 2, character 2.	Note Grounded input as noted in chart will always be logic 0 output.																																									
	b. Apply logic 1 inputs at inputs associated with word 2, character 2 (see chart).																																										
(Cont)		Verify that associated outputs are at logic 1.																																									

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																												
7. (Cont)	Note RF GAIN switch applies logic 1 input in the position indicated in the chart (positions read as MAX minus X number of positions). In the MAX position, this switch applies logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 2, character 2 (see chart).	Verify that associated outputs are at logic 0.																																													
	<table><tr><th>FRONT-PANEL CONTROL</th><th>BIT NO</th><th>INPUTS P1-()</th><th>OUTPUTS P1-()</th><th>IF ABNORMAL CHECK</th></tr><tr><td>NA</td><td>1</td><td>87</td><td>26</td><td>U25, R69, U18</td></tr><tr><td rowspan="4">RF GAIN</td><td>MAX-1</td><td>2</td><td>10</td><td>U15, R65, U19</td></tr><tr><td>MAX-2</td><td>3</td><td>75</td><td>U23, R61, U20</td></tr><tr><td>MAX-4</td><td>4</td><td>11</td><td>U21, R57, U17</td></tr><tr><td>MAX-8</td><td>5</td><td>76</td><td>U24, R53, U11</td></tr><tr><td>NA</td><td>6</td><td>*</td><td>31</td><td>U16, U13</td></tr><tr><td>NA</td><td>7</td><td>38</td><td>96</td><td>U22, U12</td></tr><tr><td>NA</td><td>8</td><td>103</td><td>104</td><td>U14, R42, U9</td></tr></table>			FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK	NA	1	87	26	U25, R69, U18	RF GAIN	MAX-1	2	10	U15, R65, U19	MAX-2	3	75	U23, R61, U20	MAX-4	4	11	U21, R57, U17	MAX-8	5	76	U24, R53, U11	NA	6	*	31	U16, U13	NA	7	38	96	U22, U12	NA	8	103	104	U14, R42, U9		
	FRONT-PANEL CONTROL			BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK																																								
NA	1	87	26	U25, R69, U18																																											
RF GAIN	MAX-1	2	10	U15, R65, U19																																											
	MAX-2	3	75	U23, R61, U20																																											
	MAX-4	4	11	U21, R57, U17																																											
	MAX-8	5	76	U24, R53, U11																																											
NA	6	*	31	U16, U13																																											
NA	7	38	96	U22, U12																																											
NA	8	103	104	U14, R42, U9																																											
*Grounded input.																																															
8. Word 2, character 3 outputs	a. Strap mux control lines for word 2, character 3.	Note Grounded input as noted in chart will always be logic 0 output. Verify that associated outputs are at logic 1.																																													
	b. Apply logic 1 inputs at inputs associated with word 2, character 3 (see chart).																																														
	Note AGC switch applies logic 1 input in the position indicated in the chart. In the AGC-SLOW position, this switch applies logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 2, character 3 (see chart).			Verify that associated outputs are at logic 0.																																											
(Cont)																																															

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION		IF INDICATION IS ABNORMAL	
8. (Cont)					
	FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	AGC-FAST (B)	1	20	26	U25, U18
	AGC-OFF (B)	2	19	28	U15, U19
	AGC-FAST (A)	3	85	29	U23, U20
	AGC-OFF (A)	4	84	94	U21, U17
	NA	5	37	30	U24, U11
	NA	6	106	31	U16, U13
	NA	7	41	96	U22, U12
	NA	8	*	104	U14, U9
*Grounded input.					
9. Word 2, character 4 outputs	a. Strap mux control lines for word 2, character 4.				
	b. Apply logic 1 inputs at inputs associated with word 2, character 4 (see chart).		Verify that associated outputs are at logic 1.		
	Note MODE switch and/or BANDWIDTH switch applies logic 1 input in the position indicated in the chart. In the LSB position, the MODE switch applies logic 0 inputs.				
	c. Apply logic 0 inputs at inputs associated with word 2, character 4 (see chart).		Verify that associated outputs are at logic 0.		
	FRONT-PANEL CONTROL (MODE)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	SSB/CW-USB or USB	1	32	26	U25, R70, U18
	SSB/CW-LSB or LSB	2	97	28	U15, R66, U19
	*SSB/CW-A	3	33	29	U23, R62, U20
	*SSB/CW-B	4	98	94	U21, R58, U17
	*SSB/CW-C	5	34	30	U24, R54, U11
	*SSB/CW-D	6	35	31	U16, R50, U13
	*SSB/CW-E	7	99	96	U22, R47, U12
	*SSB/CW-16	8	100	104	U14, R44, U9
*SSB/CW applicable only on receiver control.					

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL		
10. Word 2, character 5 outputs	a. Strap mux control lines for word 2, character 5.	Verify that associated outputs are at logic 1.			
	b. Apply logic 1 inputs at inputs associated with word 2, character 5 (see chart).				
	Note MODE switch applies logic 1 input in the position indicated in the chart. In any other position, the MODE switch applies logic 0 input.		Verify that associated outputs are at logic 0.		
	c. Apply logic 0 inputs at inputs associated with word 2, character 5 (see chart).				
	FRONT-PANEL CONTROL (MODE)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	NA	1	21	26	U25, R71, U18
	NA	2	91	28	U15, R67, U19
	NA	3	92	29	U23, R63, U20
	ISB	4	74	94	U21, R59, U17
	*CW	5	9	30	U24, R55, U11
CW, LSB, USB, ISB, or SSB/CW	6	72	31	U16, R51, U13	
AM	7	8	96	U22, R48, U12	
NA	8	73	104	U14, R45, U9	
*CW applicable only on exciter control and receiver-exciter control.					
11. Word 3, character 2 outputs	a. Strap mux control lines for word 3, character 2.	Note Grounded input as noted in chart will always be logic 0 output.			
	b. Apply logic 1 inputs at inputs associated with word 3, character 2 (see chart).	Verify that associated outputs are at logic 1.			
	c. Apply logic 0 inputs at inputs associated with word 3, character 2 (see chart).	Verify that associated outputs are at logic 0.			
	(Cont)				

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL		
11. (Cont)					
	FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	NA	1	112	26	U18, R103, U25
	NA	2	47	28	U19, R97, R15
	NA	3	113	29	U20, R91, U23
	NA	4	48	94	U17, R86, U21
	NA	5	107	30	U11, R81, U24
	NA	6	*	31	U13, U16
	NA	7	38	96	U12, U22
	NA	8	103	104	U9, R42, U14
*Grounded input.					
12. Word 3, character 3 outputs	a. Strap mux control lines for word 3, character 3.				
	b. Apply logic 1 inputs at inputs associated with word 3, character 3 (see chart).		Verify that associated outputs are at logic 1.		
	c. Apply logic 0 inputs at inputs associated with word 3, character 3 (see chart).		Verify that associated outputs are at logic 0.		
	FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	NA	1	42	26	U18, R104, U25
	NA	2	108	28	U19, R98, U15
	NA	3	43	29	U20, R92, U23
	NA	4	109	94	U17, R87, U21
	NA	5	44	30	U11, R82, U24
	NA	6	110	31	U13, R78, U16
NA	7	111	96	U12, R75, U22	
NA	8	46	104	U9, R72, U14	

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																													
13. Word 3, character 4 outputs	a. Strap mux control lines for word 3, character 4.	Note Grounded input as noted in chart will always be logic 0 output. Verify that all associated outputs are at logic 0.																																														
	<table><tr><th>FRONT-PANEL CONTROL</th><th>BIT NO</th><th>INPUTS P1-()</th><th>OUTPUTS P1-()</th><th>IF ABNORMAL CHECK</th></tr><tr><td>NA</td><td>1</td><td>*</td><td>26</td><td>U18, U25</td></tr><tr><td>NA</td><td>2</td><td>*</td><td>28</td><td>U19, U15</td></tr><tr><td>NA</td><td>3</td><td>*</td><td>29</td><td>U20, U23</td></tr><tr><td>NA</td><td>4</td><td>*</td><td>94</td><td>U17, U21</td></tr><tr><td>NA</td><td>5</td><td>*</td><td>30</td><td>U11, U24</td></tr><tr><td>NA</td><td>6</td><td>*</td><td>31</td><td>U13, U16</td></tr><tr><td>NA</td><td>7</td><td>*</td><td>96</td><td>U12, U22</td></tr><tr><td>NA</td><td>8</td><td>*</td><td>104</td><td>U9, U14</td></tr></table>			FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK	NA	1	*	26	U18, U25	NA	2	*	28	U19, U15	NA	3	*	29	U20, U23	NA	4	*	94	U17, U21	NA	5	*	30	U11, U24	NA	6	*	31	U13, U16	NA	7	*	96	U12, U22	NA	8	*	104	U9, U14
	FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK																																											
	NA	1	*	26	U18, U25																																											
NA	2	*	28	U19, U15																																												
NA	3	*	29	U20, U23																																												
NA	4	*	94	U17, U21																																												
NA	5	*	30	U11, U24																																												
NA	6	*	31	U13, U16																																												
NA	7	*	96	U12, U22																																												
NA	8	*	104	U9, U14																																												
*Grounded input.																																																
14. Word 3, character 5 outputs	a. Strap mux control lines for word 3, character 5.	Note Grounded input as noted in chart will always be logic 0 output.																																														
	b. Apply logic 1 inputs at inputs associated with word 3, character 5 (see chart).	Verify that associated outputs are at logic 1.																																														
	Note PA PWR and P CAR switches apply logic 1 inputs in the positions indicated in the chart. In the OFF positions these switches apply logic 0 inputs.																																															
(Cont)	c. Apply logic 0 inputs at inputs associated with word 3, character 5 (see chart).	Verify that associated outputs are at logic 0.																																														

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION		IF INDICATION IS ABNORMAL	
14. (Cont)					
	FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	PA PWR-STBY	1	79	26	U18, R105, U25
	PA PWR-HIGH PWR	2	14	28	U19, R99, U15
	PA PWR-LOW PWR	3	78	29	U20, R93, U23
	P CAR-ON	4	82	94	U17, R8, U21
	NA	5	81	30	U11, R83, U24
	NA	6	*	31	U13, U16
	NA	7	*	96	U12, U22
	NA	8	*	104	U9, U14
*Grounded input.					
15. Word 4, character 2 outputs (Cont)	a. Strap mux control lines for word 4, character 2.		Note Grounded input as noted in chart will always be logic 0 output.		
	b. Apply logic 1 inputs at inputs associated with word 4, character 2 (see chart). Note KEY switch in the LOCK position applies a logic 1 input and in the NORM position applies a logic 0 input.		Verify that associated outputs are at logic 1.		
	c. Apply logic 0 inputs at inputs associated with word 4, character 2 (see chart).		Verify that associated outputs are at logic 0.		

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL	
15. (Cont)	FRONT-PANEL CONTROL		BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	NA		1	*	26	U18, U25
	NA		2	*	28	U19, U15
	NA		3	*	29	U20, U23
	NA		4	*	94	U17, U21
	KEY-LOCK		5	68	30	U11, R12, U24
	NA		6	*	31	U13, U16
	NA		7	38	96	U12, U22
	NA		8	103	104	U9, R42, U14
	*Grounded input.					
16. Word 4, character 3 outputs	a. Strap mux control lines for word 4, character 3.					
	b. Apply logic 1 inputs at inputs associated with word 4, character 3 (see chart).			Verify that associated outputs are at logic 1.		
	c. Apply logic 0 inputs at inputs associated with word 4, character 3 (see chart).			Verify that associated outputs are at logic 0.		
	FRONT-PANEL CONTROL		BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	NA		1	18	26	U18, R106, U25
	NA		2	101	28	U19, R100, U15
	NA		3	39	29	U20, R94, U23
	NA		4	83	94	U17, R88, U21
	NA		5	36	30	U11, R84, U24
	NA		6	105	31	U13, R79, U16
NA		7	40	96	U12, R76, U22	
NA		8	2	104	U9, R73, U14	

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
17. Word 4, character 4 outputs	a. Strap mux control lines for word 4, character 4.		
	b. Apply logic 1 inputs at inputs associated with word 4, character 4 (see chart).	Verify that associated outputs are at logic 1.	
	c. Apply logic 0 inputs at inputs associated with word 4, character 4 (see chart).	Verify that associated outputs are at logic 0.	
18. Word 4, character 5 outputs (Cont)	a. Strap mux control lines for word 4, character 5.		
	b. Apply logic 1 inputs at inputs associated with word 4, character 5 (see chart).		
	c. Apply logic 0 inputs at inputs associated with word 4, character 5 (see chart).		

FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
NA	1	3	26	U18, R107, U25
NA	2	86	28	U19, R101, U15
NA	3	49	29	U20, R95, U23
NA	4	67	94	U17, R89, U21
NA	5	70	30	U11, R85, U24
NA	6	5	31	U13, R80, U16
NA	7	4	96	U12, R77, U22
NA	8	69	104	U9, R74, U14

Table 2. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
18. (Cont)					
	FRONT-PANEL CONTROL	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
	NA	1	80	26	U18, R108, U25
	NA	2	16	28	U19, R102, CR24, C28, U15
	NA	3	95	29	U20, R96, U23
	NA	4	71	94	U17, R90, U21
	NA	5	*	30	U11, U24
	NA	6	*	31	U13, U16
	NA	7	*	96	U12, U22
	NA	8	*	104	U9, U14
*Grounded input.					

Table 3. Parallel Input, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	Note The testing and troubleshooting procedures herein are for 1-, 2-, 3-, or 4-channel configurations of the HF-8014/8014A, HF-8054/8054A, HF-8093, and HF-8094. These testing and troubleshooting procedures are based on using a control unit and an associated local unit. The most effective method of testing and troubleshooting is obtained by installing the questionable parallel input in the control unit. During these tests when a control unit is referred to it is an exciter control, or a receiver control. When a local unit is referred to it is a receiver-exciter, an exciter, or a receiver. a. Remove top cover of unit containing parallel input to be tested. b. Remove parallel input. c. Set the dip switches for four-channel operation. (Group 1 closed, group 2 open.) Refer to figure 2 for dip switch location. d. Place the parallel input card on the card extender and place it in the unit. e. Set control unit and local unit LINE SELECTOR switches to 115 V. f. Connect control unit and local unit to 115-V ac power source and set power on.		
(Cont)			

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. (Cont)	g. Measure dc voltages, on the card under test, between the following pins and ground (TP1, brown): P1-45 P1-65 P1-114 h. Strap local unit for address 0. i. Connect local unit to control unit.	+15 $\pm$ 1.0 V dc. +5 $\pm$ 0.5 V dc. -15 $\pm$ 1.0 V dc.	

Note

Tests 2 through 17 are output tests. During all of these tests serial interface card A13 is removed from unit under test and mux inputs are strapped according to word and character being tested. To strap a logic 1 input, connect a 4700- Ω resistor in series between the mux input pin and +5 V dc. To strap a logic 0 input, connect directly from the mux input pin to ground. See following chart and figure for mux input/output strapping and setup requirements. Where front-panel controls are shown, these controls may be used to apply the appropriate inputs. If they are not used their associated front-panel connector must be disconnected. Signal names are given in parentheses () where there is not a front-panel control.

MUX CONTROL LINES INPUT STRAPPING				*OUTPUTS PRESENTED BY PARALLEL INPUT CARD									
				WORD NO	CHARACTER NO	OUTPUT BIT NO							
MX8	MX4	MX2	MX1			1	2	3	4	5	6	7	8
P1-93	P1-90	P1-25	P1-27			P1-26	P1-28	P1-29	P1-94	P1-30	P1-31	P1-96	P1-104
0	0	0	0	1	2	P1-62	P1-127	P1-63	P1-128	P1-64	P1-129	P1-38	P1-103
0	0	0	1	1	3	P1-58	P1-123	P1-59	P1-124	P1-60	P1-125	P1-61	P1-126
0	0	1	0	1	4	P1-54	P1-119	P1-55	P1-120	P1-56	P1-121	P1-57	P1-122
0	0	1	1	1	5	P1-50	P1-115	P1-51	P1-116	P1-52	P1-117	P1-53	P1-118
0	1	0	0	2	2	P1-87	P1-10	P1-75	P1-11	P1-76	NA	NA	NA
0	1	0	1	2	3	P1-20	P1-19	P1-85	P1-84	P1-37	P1-106	P1-41	P1-12
*Outputs presented at the bit no pins are the inputs at the bit no pins associated with the word no/character no.													
(Cont)													

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST				PROCEDURE		NORMAL INDICATION		IF INDICATION IS ABNORMAL					
1. (Cont)													
MUX CONTROL LINES INPUT STRAPPING				*OUTPUTS PRESENTED BY PARALLEL INPUT CARD									
MX8	MX4	MX2	MX1	WORD NO	CHARACTER NO	OUTPUT BIT NO							
						1	2	3	4	5	6	7	8
P1-93	P1-90	P1-25	P1-27			P1-26	P1-28	P1-29	P1-94	P1-30	P1-31	P1-96	P1-104
0	1	1	0	2	4	P1-32	P1-97	P1-33	P1-98	P1-34	P1-35	P1-99	P1-100
0	1	1	1	2	5	P1-21	P1-91	P1-92	P1-74	P1-9	P1-72	P1-8	P1-73
1	0	0	0	3	2	P1-112	P1-47	P1-113	P1-48	P1-107	NA	NA	NA
1	0	0	1	3	3	P1-42	P1-108	P1-43	P1-109	P1-44	P1-110	P1-111	P1-46
1	0	1	0	3	4	P2-4	P2-6	P2-5	P2-3	P2-9	P2-10	P2-8	P2-7
1	0	1	1	3	5	P1-79	P1-14	P1-78	P1-82	P1-81	NA	NA	NA
1	1	0	0	4	2	P1-24	P1-22	P1-23	P1-88	P1-68	P1-13	NA	NA
1	1	0	1	4	3	P1-18	P1-101	P1-39	P1-83	P1-36	P1-105	P1-40	P1-2
1	1	1	0	4	4	P1-3	P1-86	P1-49	P1-67	P1-70	P1-5	P1-4	P1-69
1	1	1	1	4	5	P1-80	P1-16	P1-95	P1-71	P1-89	P1-7	P1-102	P1-77
*Outputs presented at the bit no pins are the inputs at the bit no pins associated with the word no/character no.													

TYPICAL MUX INPUT/OUTPUT TEST SETUP

TP5-4247-013

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. Word 1, character 2 outputs	a. Strap mux control lines for word 1, character 2. b. Apply logic 1 inputs at inputs associated with word 1, character 2 (see chart). Note FREQUENCY KHZ switches apply logic 1 inputs in the positions indicated in the chart. In the 0 position these switches apply logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 1, character 2 (see chart).	Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	

EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
1 MHz { 1 2 4 8	1 MHz { 1 2 4 8	1	62	26	U25, U18
		2	127	28	U15, U19
		3	63	29	U23, U20
		4	128	94	U21, U17
10 MHz { 1 2	10 MHz { 1 2	5	64	30	U24, U11
		6	129	31	U16, U13
NA	NA	7	38	96	U22, U12
NA	NA	8	103	104	U14, R42, U9

3. Word 1, character 3 outputs	a. Strap mux control lines for word 1, character 3. b. Apply logic 1 inputs at inputs associated with word 1, character 3 (see chart). Note FREQUENCY KHZ switches apply logic 1 inputs in the positions indicated in the chart. In the 0 position, these switches apply logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 1, character 3 (see chart).	Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	
(Cont)			

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)					
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
10 kHz 1 2 4 8	10 kHz 1 2 4 8	1	58	26	U25, U18
		2	123	28	U15, U19
		3	59	29	U23, U20
		4	124	94	U21, U17
100 kHz 1 2 4 8	100 kHz 1 2 4 8	5	60	30	U24, U11
		6	125	31	U16, U13
		7	61	96	U22, U12
		8	126	104	U14, U9
4. Word 1, character 4 outputs	a. Strap mux control lines for word 1, character 4. b. Apply logic 1 inputs at inputs associated with word 1, character 4 (see chart). Note FREQUENCY KHZ switches apply logic 1 inputs in the positions indicated in the chart. In the 0 position, these switches apply logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 1, character 4 (see chart).			Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
100 Hz 1 2 4 8	100 Hz 1 2 4 8	1	54	26	U25, U18
		2	119	28	U15, U19
		3	55	29	U23, U20
		4	120	94	U21, U17
1 kHz 1 2 4 8	1 kHz 1 2 4 8	5	56	30	U24, U11
		6	121	31	U16, U13
		7	57	96	U22, U12
		8	122	104	U14, U9

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL		
5. Word 1, character 5 outputs	a. Strap mux control lines for word 1, character 5. b. Apply logic 1 inputs at inputs associated with word 1, character 5 (see chart). Note FREQUENCY KHZ switches apply logic 1 inputs in the positions indicated in the chart. In the 0 position, these switches apply logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 1, character 5 (see chart).	Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.			
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
NA	NA	1	50	26	U25, R68, U18
NA	NA	2	115	28	U15, R64, U19
NA	NA	3	51	29	U23, R60, U20
NA	NA	4	116	94	U21, R56, U17
1	1	5	52	30	U24, R52, U11
2	2	6	117	31	U16, R49, U13
4	4	7	53	96	U22, R46, U12
8	8	8	118	104	U14, R43, U9
*10 Hz	*10 Hz				
*Applicable only with 10-Hz front-panel tuning.					
6. Word 2, character 2 outputs	a. Strap mux control lines for word 2, character 2. b. Apply logic 1 inputs at inputs associated with word 2, character 2 (see chart).	Note Grounded input as noted in chart will always be logic 0 output. Verify that associated outputs are at logic 1.			
(Cont)					

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL		
6. (Cont)	Note RF GAIN switch applies logic 1 input in the position indicated in the chart (positions read as MAX minus X number of positions). In the MAX position, this switch applies logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 2, character 2 (see chart).	Verify that associated outputs are at logic 0.			
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
NA	(1) (2) (4) (8) (16) RF GAIN	1	87	26	U25, R69, U18
NA		2	10	28	U15, R65, U19
NA		3	75	29	U23, R61, U20
NA		4	11	94	U21, R57, U17
NA		5	76	30	U24, R53, U11
NA	NA	6	*	31	U16, U13
NA	NA	7	38	96	U22, U12
NA	NA	8	103	104	U14, R42, U9
*Grounded input.					
7. Word 2, character 3 outputs	a. Strap mux control lines for word 2, character 3. b. Apply logic 1 inputs at inputs associated with word 2, character 3 (see chart). c. Apply logic 0 inputs at inputs associated with word 2, character 3 (see chart).	Note Grounded input as noted in chart will always be logic 0 output. Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.			
(Cont)					

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)					
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
NA	AGC-A2 (1)	1	20	26	U25, U18
NA	AGC-A2 (2)	2	19	28	U15, U19
NA	AGC-B2 (1)	3	85	29	U23, U20
NA	AGC-B2 (2)	4	84	94	U21, U17
NA	FL4 (B) ENBL	5	37	30	U24, U11
NA	FL5 (C) ENBL	6	106	31	U16, U13
NA	FL6 (D) ENBL	7	41	96	U22, U12
NA	FL7 (E) ENBL	8	12	104	U14, U9
8. Word 2, character 4 outputs	a. Strap mux control lines for word 2, character 4. b. Apply logic 1 inputs at inputs associated with word 2, character 4 (see chart). c. Apply logic 0 inputs at inputs associated with word 2, character 4 (see chart).			Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
PEAK CLIP ENABLE	AGC-A1 (1)	1	32	26	U25, R70, U18
NA	AGC-A1 (2)	2	97	28	U15, R66, U19
NA	AGC-B1 (1)	3	33	29	U23, R62, U20
NA	AGC-B1 (2)	4	98	94	U21, R58, U17
NA	AFC ENBL	5	34	30	U24, R54, U11
NA	VBFO ENBL	6	35	31	U16, R50, U13
NA	FL1 ENBL	7	99	96	U22, R47, U12
NA	FL3 (A) ENBL	8	100	104	U14, R44, U9

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. Word 2, character 5 outputs	a. Strap mux control lines for word 2, character 5. b. Apply logic 1 inputs at inputs associated with word 2, character 5 (see chart). c. Apply logic 0 inputs at inputs associated with word 2, character 5 (see chart).	Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	

EXCITER FRONT-PANEL CONTROL (MODE) (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (MODE) (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
12 ENBL	A2 ENBL	1	21	26	U25, R71, U18
A1 ENBL	A1 ENBL	2	91	28	U15, R67, U19
B1 ENBL	B1 ENBL	3	92	29	U23, R63, U20
B2 ENBL	B2 ENBL	4	74	94	U21, R59, U17
ISB ENBL	ISB ENBL	5	9	30	U24, R55, U11
CW ENBL	CW ENBL	6	72	31	U16, R51, U13
AM ENBL	AM ENBL	7	8	96	U22, R48, U12
NA	DATA NET ENBL	8	73	104	U14, R45, U9

10. Word 3, character 2 outputs	a. Strap mux control lines for word 3, character 2. b. Apply logic 1 inputs at inputs associated with word 3, character 2 (see chart). c. Apply logic 0 inputs at inputs associated with word 3, character 2 (see chart).	Note Grounded input as noted in chart will always be logic 0 output. Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	
(Cont)			

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
10. (Cont)					
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
NA	1 VBFO 1 kHz 8	1	112	26	U18, U103, U25
NA		2	47	28	U19, R97, R15
NA		3	113	29	U20, R91, U23
NA		4	48	94	U17, R86, U21
NA	(VBFO SIGN)	5	107	30	U11, R81, U24
NA	NA	6	*	31	U13, U16
NA	NA	7	38	96	U12, U22
NA	NA	8	103	104	U9, R42, U14
*Grounded input.					
11. Word 3, character 3 outputs	a. Strap mux control lines for word 3, character 3. b. Apply logic 1 inputs at inputs associated with word 3, character 3 (see chart). c. Apply logic 0 inputs at inputs associated with word 3, character 3 (see chart).			Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
NA	1 VBFO 10 Hz 8	1	42	26	U18, R104, U25
NA		2	108	28	U19, R98, U15
NA		3	43	29	U20, R92, U23
NA		4	109	94	U17, R87, U21
NA	1 VBFO 100 Hz 8	5	44	30	U11, R82, U24
NA		6	110	31	U13, R78, U16
NA		7	111	96	U12, R75, U22
NA		8	46	104	U9, R72, U14

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION			IF INDICATION IS ABNORMAL
12. Word 3, character 4 outputs	a. Strap mux control lines for word 3, character 4.	Note Grounded input as noted in chart will always be logic 0 output. Verify that all associated outputs are at logic 0.			
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P2-()	OUTPUTS P1-()	IF ABNORMAL CHECK
NA	NA	1	4	26	U18, U25
NA	NA	2	6	28	U19, U15
NA	NA	3	5	29	U20, U23
NA	NA	4	3	94	U17, U21
NA	NA	5	9	30	U11, U24
NA	NA	6	10	31	U13, U16
NA	NA	7	8	96	U12, U22
NA	NA	8	7	104	U9, U14
13. Word 3, character 5 outputs	a. Strap mux control lines for word 3, character 5. b. Apply logic 1 inputs at inputs associated with word 3, character 5 (see chart). Note PA PWR and PILOT CARR switches apply logic 1 inputs in the positions indicated in the chart. In the OFF positions these switches apply logic 0 inputs. c. Apply logic 0 inputs at inputs associated with word 3, character 5 (see chart).	Note Grounded input as noted in chart will always be logic 0 output. Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.			
(Cont)					

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
13. (Cont)					
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
PA PWR-STBY	A2 AGC BUS	1	79	26	U18, R105, U25
PA PWR-HIGH PWR	A1 AGC BUS	2	14	28	U19, R99, U15
PA PWR-LOW PWR	B1 AGC BUS	3	78	29	U20, R93, U23
PILOT CARR-ON	B2 AGC BUS	4	82	94	U17, R8, U21
NA	NA	5	81	30	U11, R83, U24
NA	NA	6	*	31	U13, U16
NA	NA	7	*	96	U12, U22
NA	NA	8	*	104	U9, U14
*Grounded input.					
14. Word 4, character 2 outputs	a. Strap mux control lines for word 4, character 2.			Note Grounded input as noted in chart will always be logic 0 output.	
(Cont)	b. Apply logic 1 inputs at inputs associated with word 4, character 2 (see chart).			Verify that associated outputs are at logic 1.	
	c. Apply logic 0 inputs at inputs associated with word 4, character 2 (see chart).			Verify that associated outputs are at logic 0.	

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
14. (Cont)					
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
(A2 AF MON)	(A2 AF MON)	1	24	26	U18, U25
(A1 AF MON)	(A1 AF MON)	2	22	28	U19, U15
(B1 AF MON)	(B1 AF MON)	3	23	29	U20, U23
(B2 AF MON)	(B2 AF MON)	4	88	94	U17, U21
(REMOTE KEY (MON))	(RF OVLD MON)	5	68	30	U11, R12, U24
(EXCITER FLT)	(RECEIVER FLT)	6	13	31	U13, U16
NA	NA	7	38	96	U12, U22
NA	NA	8	103	104	U9, R42, U14
*Grounded input.					
15. Word 4, character 3 outputs	a. Strap mux control lines for word 4, character 3. b. Apply logic 1 inputs at inputs associated with word 4, character 3 (see chart). c. Apply logic 0 inputs at inputs associated with word 4, character 3 (see chart).			Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.	
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
(FREQ REF FLT)	(FREQ REF FLT)	1	18	26	U18, R106, U25
(SYNTH OUT LOCK FLT)	(SYNTH OUT LOCK FLT)	2	101	28	U19, R100, U15
(100 kHz LOCK FLT)	(100 kHz LOCK FLT)	3	39	29	U20, R94, U23
(10 kHz LOCK FLT)	(10 kHz LOCK FLT)	4	83	94	U17, R88, U21
(1 kHz LOCK FLT)	(1 kHz LOCK FLT)	5	36	30	U11, R85, U24
(100 Hz LOCK FLT)	(100 Hz LOCK FLT)	6	105	31	U13, R79, U16
(10 Hz LOCK FLT)	(10 Hz LOCK FLT)	7	40	96	U12, R76, U22
NA	NA	8	2	104	U9, R73, U14

Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL		
16. Word 4, character 4 outputs	a. Strap mux control lines for word 4, character 4. b. Apply logic 1 inputs at inputs associated with word 4, character 4 (see chart). c. Apply logic 0 inputs at inputs associated with word 4, character 4 (see chart).	Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.			
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
NA	(A2 AGC MON)	1	3	26	U18, R107, U25
(A1 IF MON)	(A1 AGC MON)	2	86	28	U19, R101, U15
(EXT STANDARD)	(B1 AGC MON)	3	49	29	U20, R95, U23
NA	(B2 AGC MON)	4	67	94	U17, R89, U21
(EXCTR PS FLT)	(RCVR PS FLT)	5	70	30	U11, R85, U24
(EXCTR RF MON)	(VBFO SYNTH FLT)	6	5	31	U13, R80, U16
(SUBCARR LOCK FLT)	(SUBCARR LOCK FLT)	7	4	96	U12, R77, U22
NA	NA	8	69	104	U9, R74, U14
17. Word 4, character 5 outputs	a. Strap mux control lines for word 4, character 5. b. Apply logic 1 inputs at inputs associated with word 4, character 5 (see chart). c. Apply logic 0 inputs at inputs associated with word 4, character 5 (see chart).	Note Grounded input as noted in chart will always be logic 0 output. Verify that associated outputs are at logic 1. Verify that associated outputs are at logic 0.			
(Cont)					

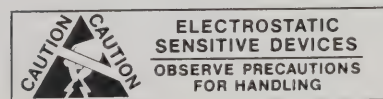
Table 3. Parallel Input, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL
17. (Cont)					
EXCITER FRONT-PANEL CONTROL (SIGNAL)	RECEIVER FRONT-PANEL CONTROL (SIGNAL)	BIT NO	INPUTS P1-()	OUTPUTS P1-()	IF ABNORMAL CHECK
(MONITOR)	(MONITOR)	1	80	26	U18, R108, U25
(LCL CONT)	(LCL CONT)	2	16	28	U19, R102, CR24, C28, U15
(DATA ERROR)	(DATA ERROR)	3	95	29	U20, R96, U23
(PRESEL FLT)	(PRESEL FLT)	4	71	94	U17, R90, U21
(CPLR FLT)	(RF XLATOR MON)	5	*	30	U11, U24
(PA RF MON)	(AFC LOCK MON)	6	*	31	U13, U16
(PA FLT)	(EXT STANDARD)	7	*	96	U12, U22
(PA READY)	NA	8	*	104	U9, U14
*Grounded input.					

4. REPAIR

Repair of the parallel input card is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



5. PARTS LIST/DIAGRAMS

5.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 3). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

5.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
-------------	------------------------------------

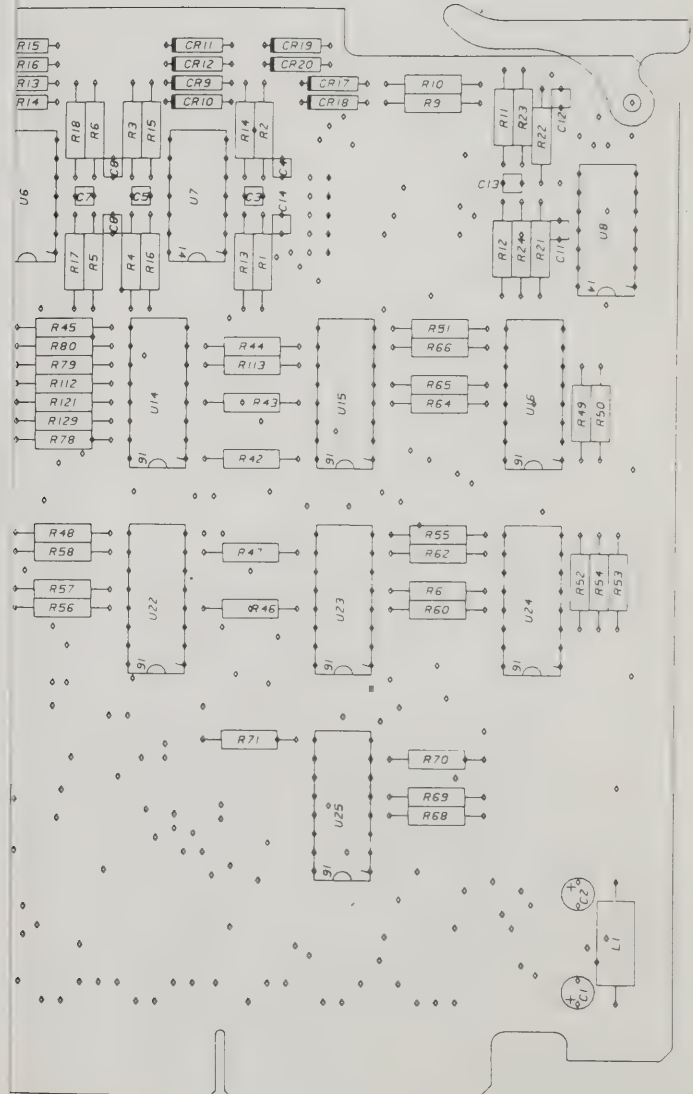
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56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
81349	MILITARY SPECIFICATION
96906	MILITARY STANDARD

5.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Parallel Input	642-3135-001	REV D

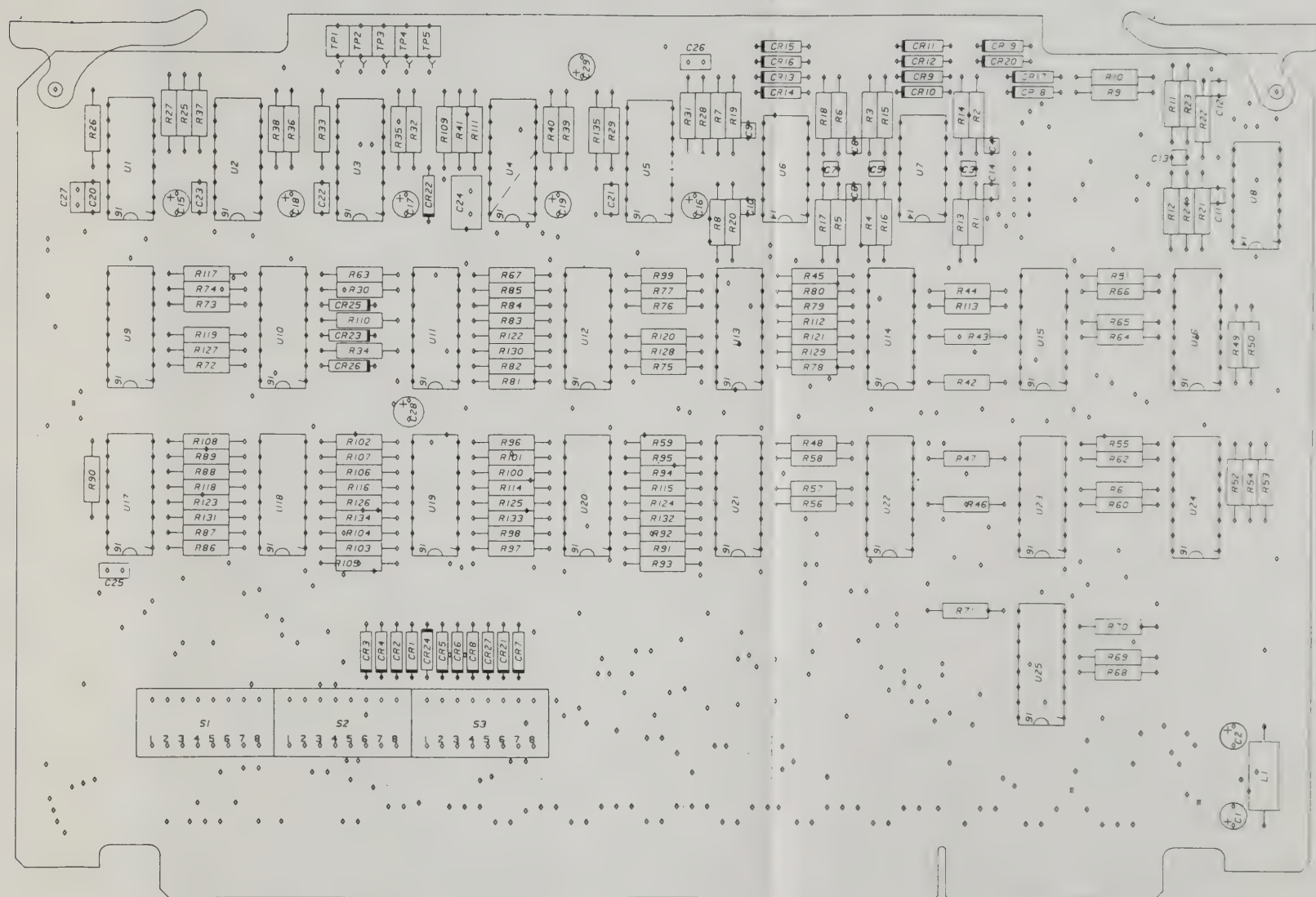
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2502-018

Parallel Input, Schematic Diagram
Figure 3 (Sheet 1 of 6)



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2502-018

Parallel Input, Schematic Diagram
Figure 3 (Sheet 1 of 6)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
	PARALLEL INPUT (ESDS)	642-3135-001		
C1-C2	SEMICONDUCTOR DEVICE	353-3644-010		03508
C1-C2	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289
C3-C14	CAPACITOR,FXD CER DIEL, 1000PF, 20%, 50V	913-3279-030		16546
C15-C19	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289
C20-C23	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349
C24	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 500V	912-3879-000		81349
C25-C27	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-680		16546
C28,C29	CAPACITOR,FXD TMTLM ELCTLT, 4.7UF, 20%, 35V	184-9102-390		56289
L1	COIL,RF 1000UH	240-2540-000		96906
R1-R12	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R13-R25	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R26	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R27,R28	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R29	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R30-R32	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R33	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R34-R36	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R37	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R38-R40	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R41	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R42-R108	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R109	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349
R110	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349
R111-	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R118				
R119-	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349
R126				
R127-	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349
R134				
R135	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349
S1-S3	SWITCH,DUAL PKG	266-0243-050		27264
TP1	JACK,TIP BRN	360-0484-070		74970
TP2	JACK,TIP RED	360-0484-020		74970
TP3	JACK,TIP ORN	360-0484-050		74970
TP4	JACK,TIP YEL	360-0484-060		74970
TP5	JACK,TIP GRN	360-0484-040		74970
U1-U5	INTEGRATED CIRCUIT (ESDS)	351-8421-020		07263
U6-U8	INTEGRATED CIRCUIT (ESDS)	351-8407-010		04713
U9	INTEGRATED CIRCUIT DATA SELECTOR	351-8420-020		04713
U10	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263
U11-U25	INTEGRATED CIRCUIT DATA SELECTOR	351-8420-020		04713

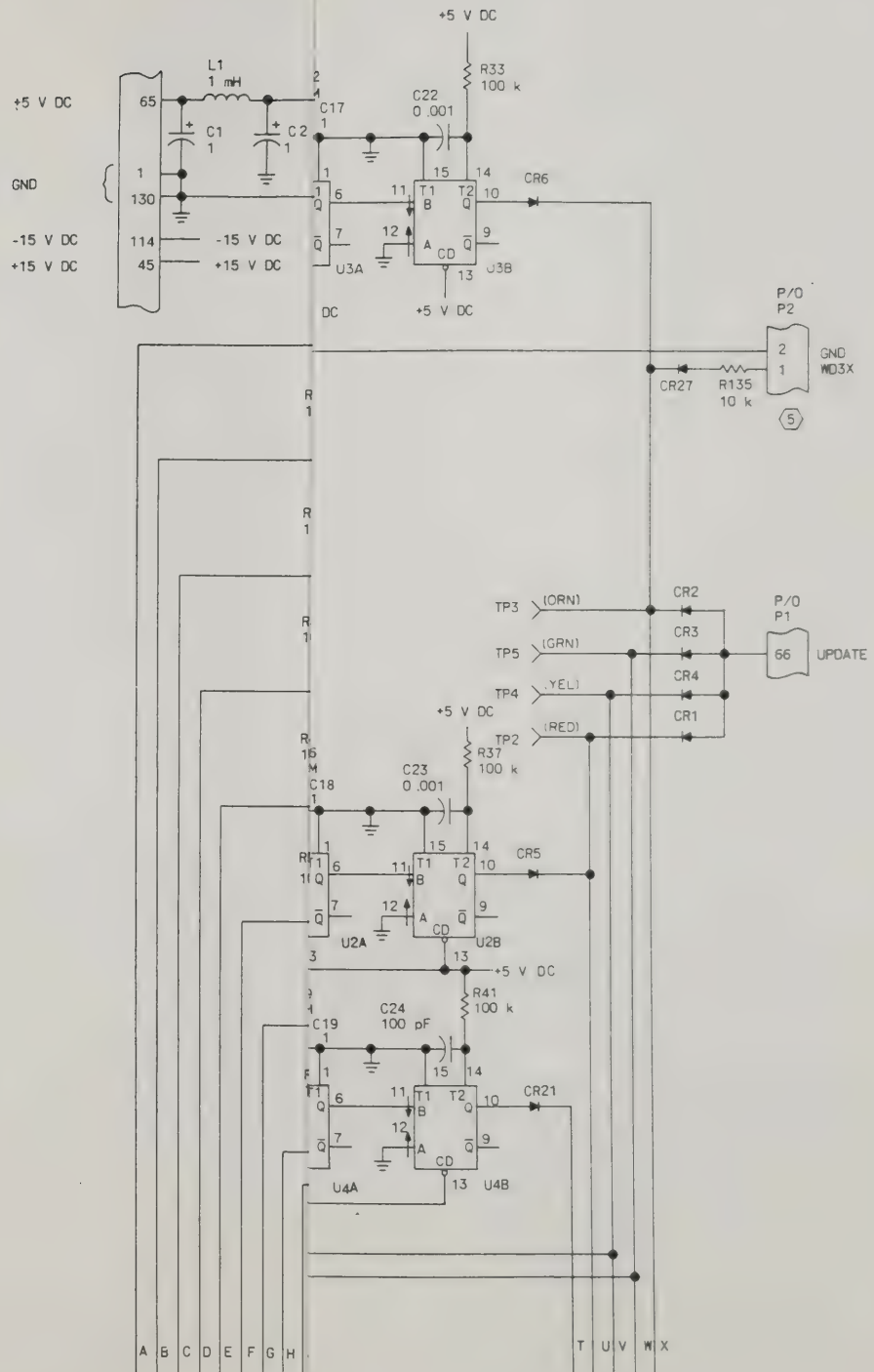
Diagram

2)

PARTS LIST

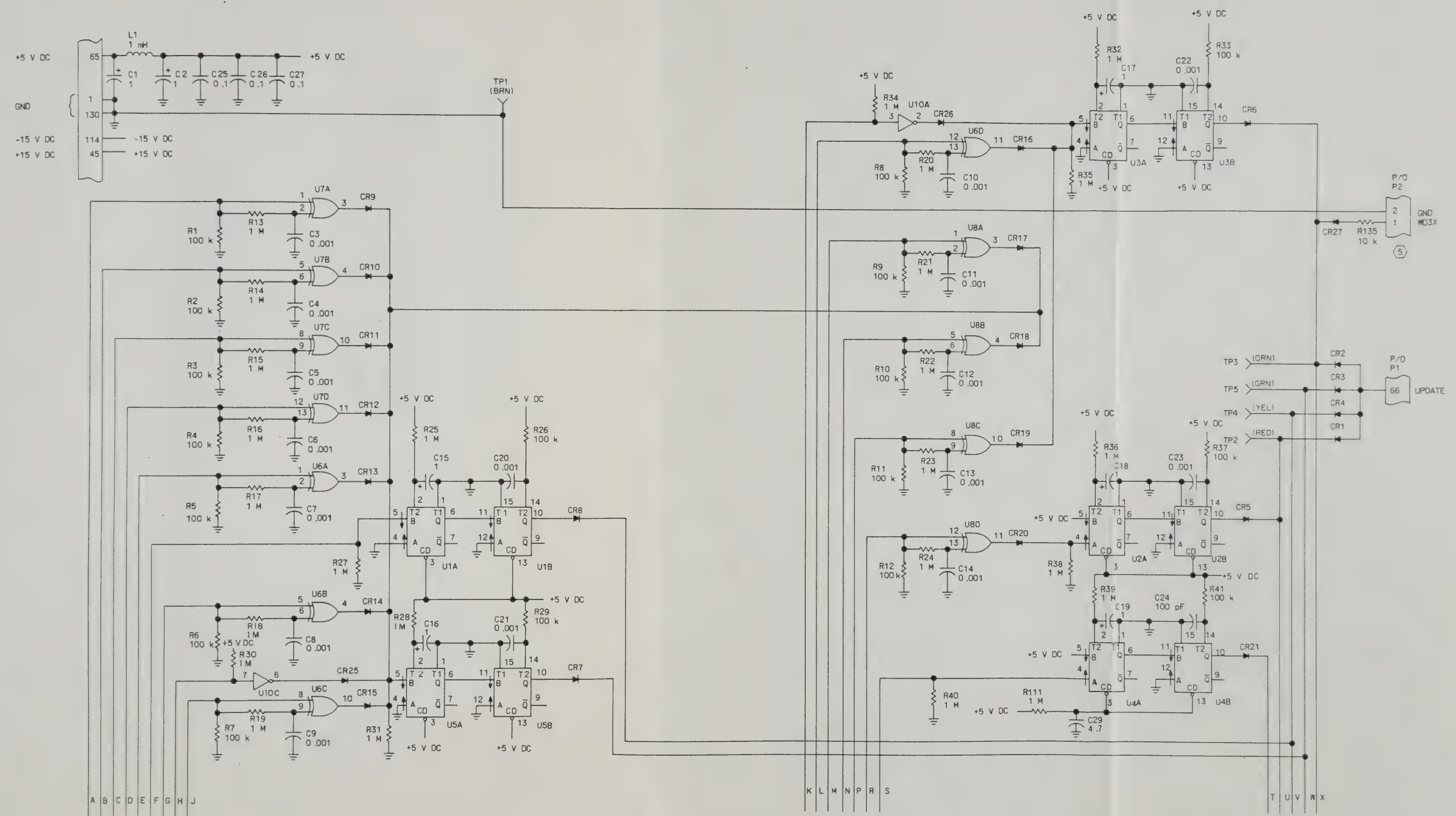
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
CR1-CR27	PARALLEL INPUT (ESDS)	642-3135-001			
C1-C2	SEMICONDUCTOR DEVICE	353-3644-010		03508	1N4454GE
C3-C14	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	1990105X0035BB1
C15-C19	CAPACITOR,FXD CER DIEL, 1000PF, 20%, 50V	913-3279-030		16546	CY10C102M
C20-C23	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	1990105X0035BB1
C24	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C25-C27	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 500V	912-3879-000		81349	CM04FD101J03
C28,C29	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-680		16546	CY20C104M
L1	CAPACITOR,FXD TMTLM ELCTLT, 4.7UF, 20%, 35V	184-9102-390		56289	1990475X0035DB1
R1-R12	COIL,RF 1000UH	240-2540-000		96906	MS90539-15
R13-R25	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R26	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R27,R28	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R29	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R30-R32	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R33	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R34-R36	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R37	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R38-R40	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R41	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R42-R108	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R109	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R110	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R111-	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R118	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R119-	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R126	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R127-	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R134	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R135	SWITCH,DUAL PKG	266-0243-050		27264	A10040-108
S1-S3	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP1	JACK,TIP RED	360-0484-020		74970	105-1102-011
TP2	JACK,TIP GRN	360-0484-050		74970	105-1106-011
TP3	JACK,TIP YEL	360-0484-060		74970	105-1107-011
TP4	JACK,TIP GRN	360-0484-040		74970	105-1104-011
TP5	INTEGRATED CIRCUIT (ESDS)	351-8421-020		07263	4528BPC
U1-U5	INTEGRATED CIRCUIT (ESDS)	351-8407-010		04713	MC14070BCP
U6-U8	INTEGRATED CIRCUIT DATA SELECTOR	351-8420-020		04713	MC14512BCP
U9	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049BPC
U10	INTEGRATED CIRCUIT DATA SELECTOR	351-8420-020		04713	MC14512BCP
U11-U25					

Parallel Input, Schematic Diagram
Figure 3 (Sheet 2)

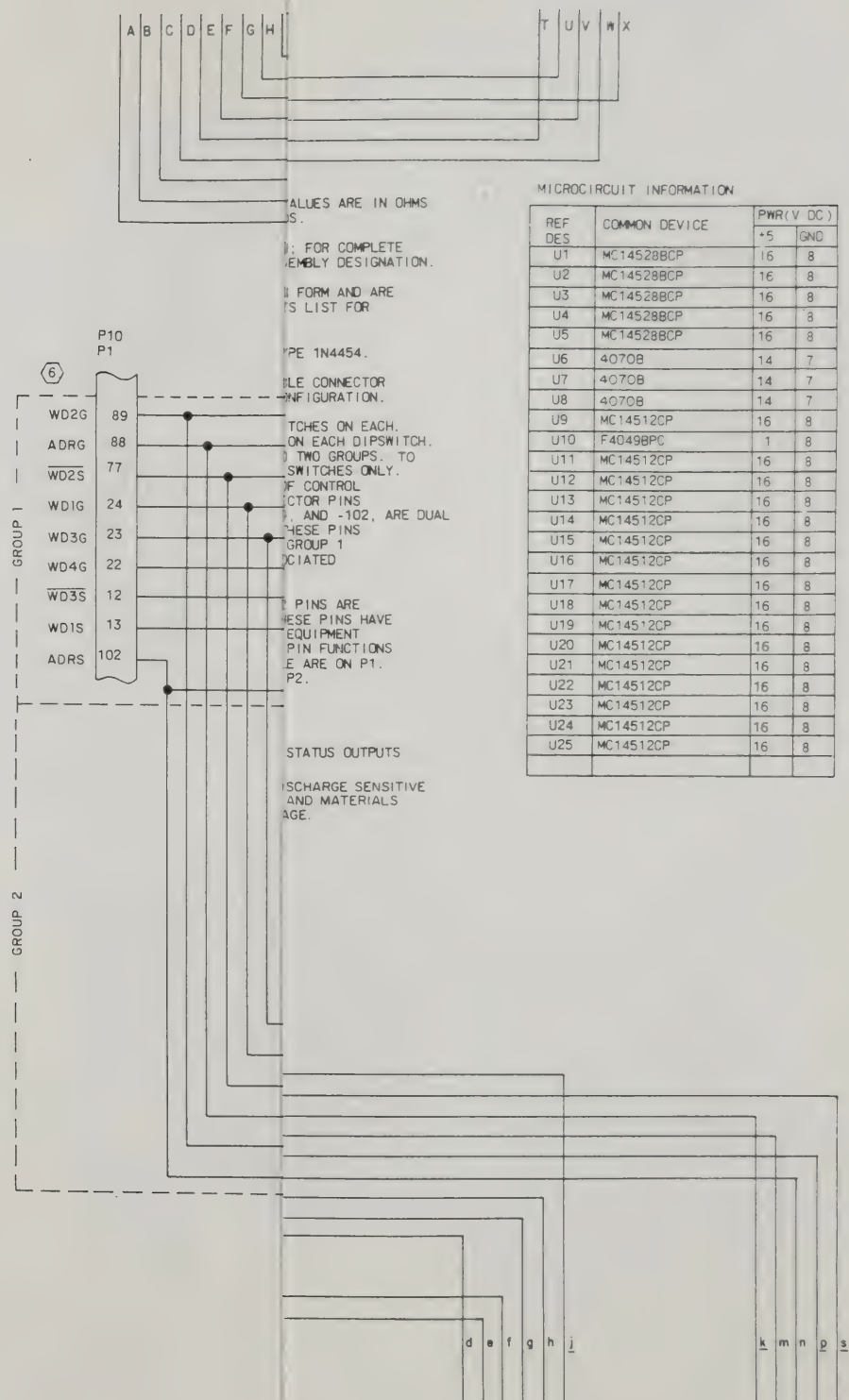


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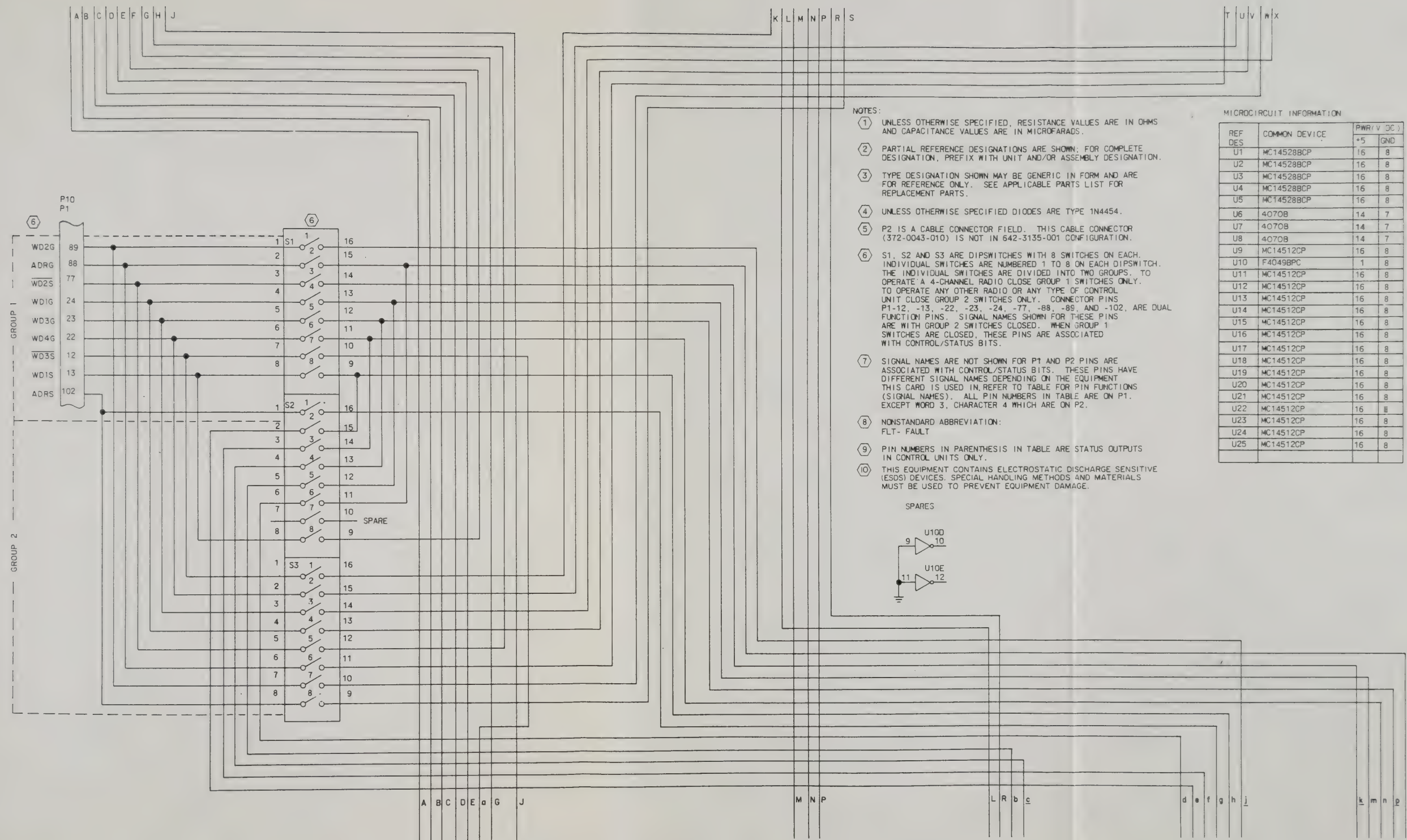
Parallel Input, Schematic Diagram
Figure 3 (Sheet 3)



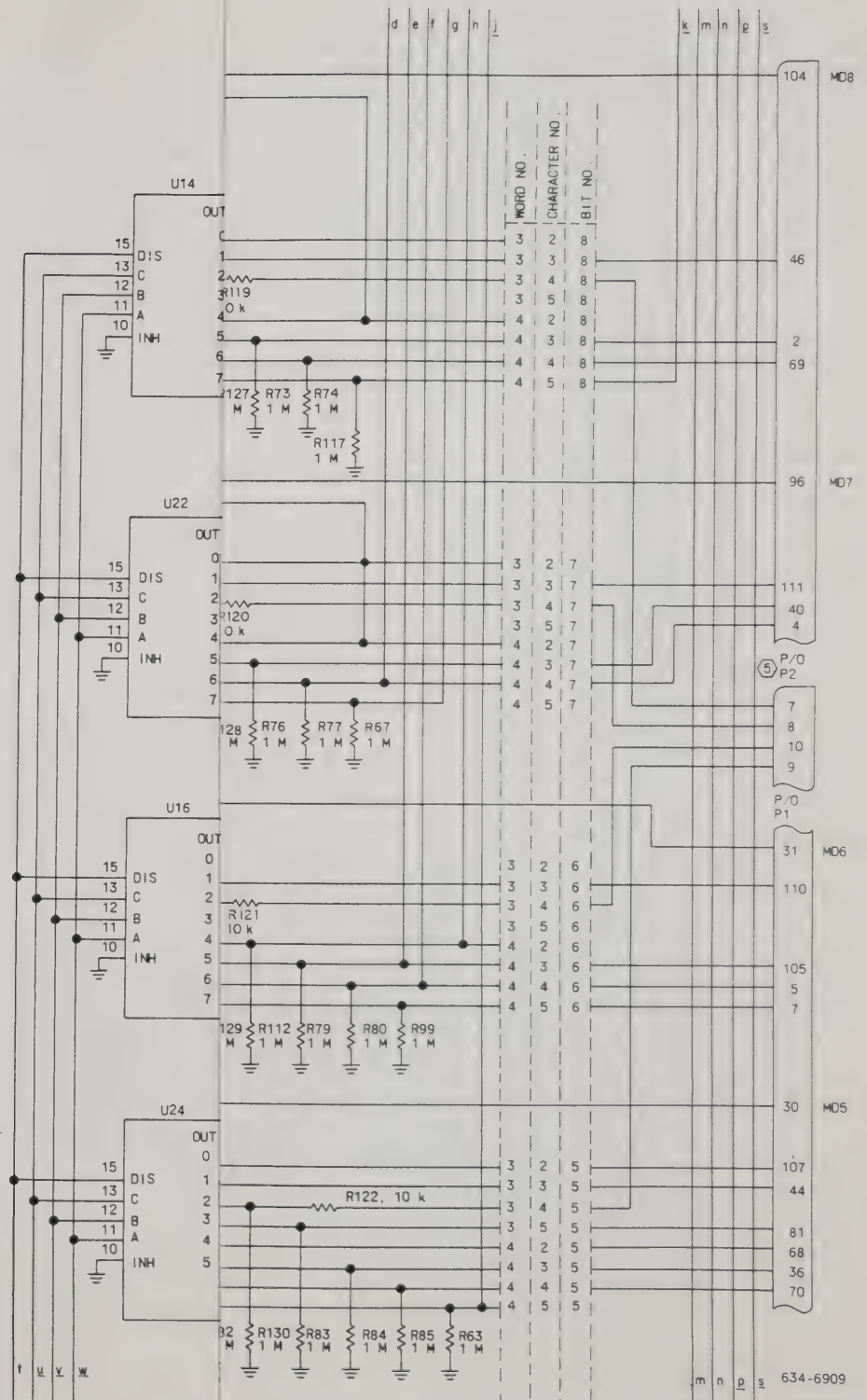
Parallel Input, Schematic Diagram
Figure 3 (Sheet 3)



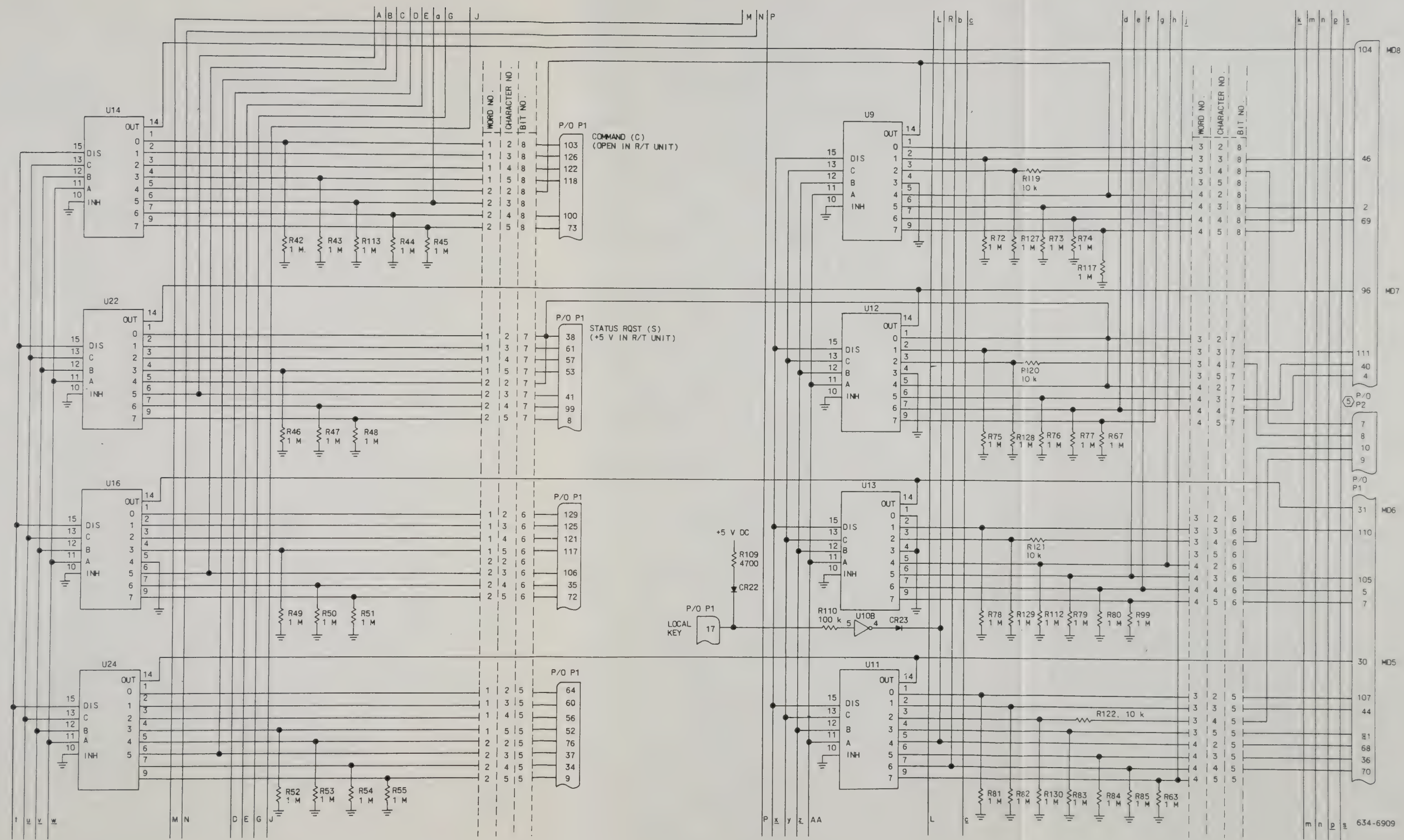
Parallel Input, Schematic Diagram
Figure 3 (Sheet 4)



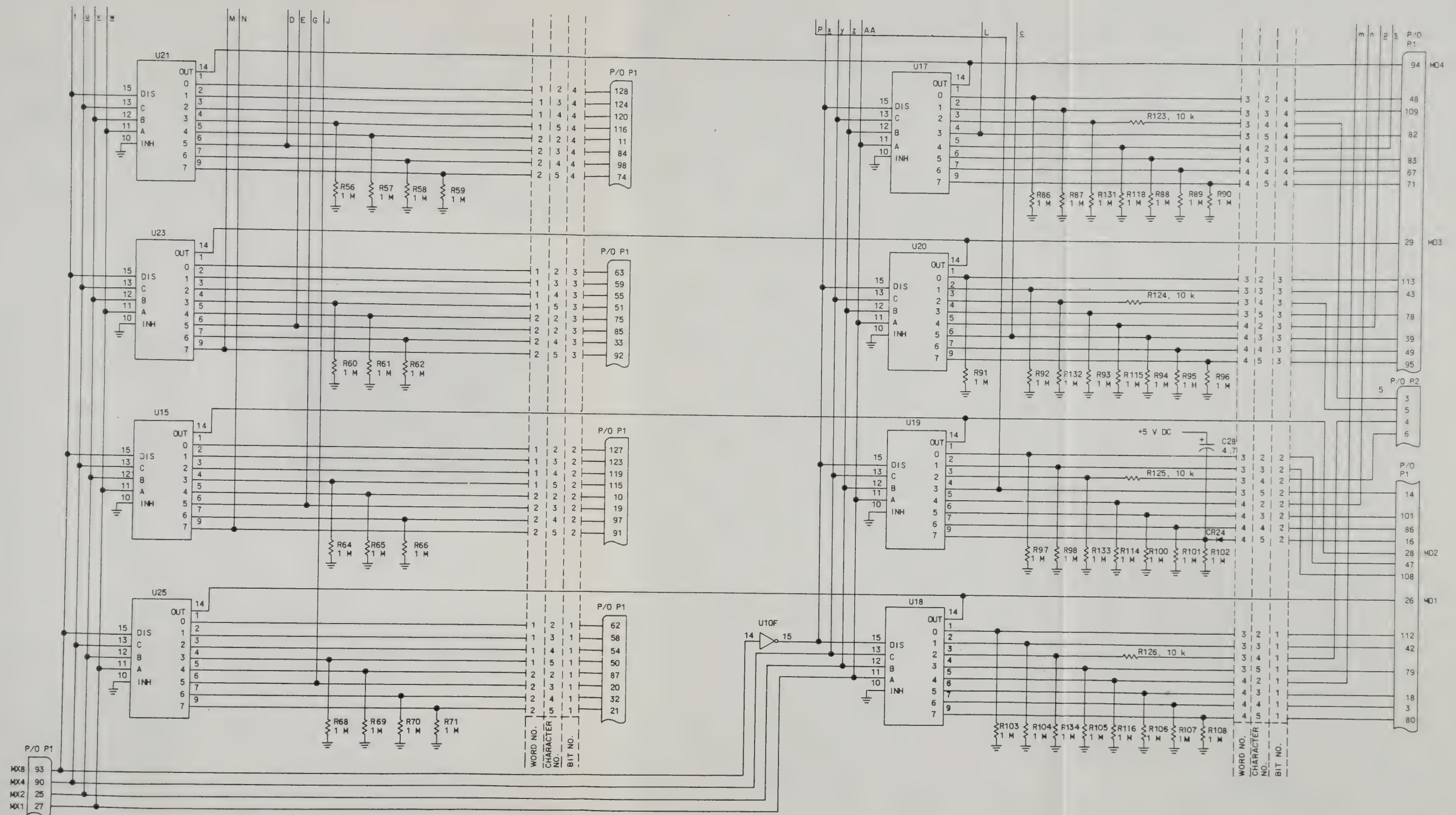
Parallel Input, Schematic Diagram
Figure 3 (Sheet 4)



Parallel Input, Schematic Diagram
Figure 3 (Sheet 5)

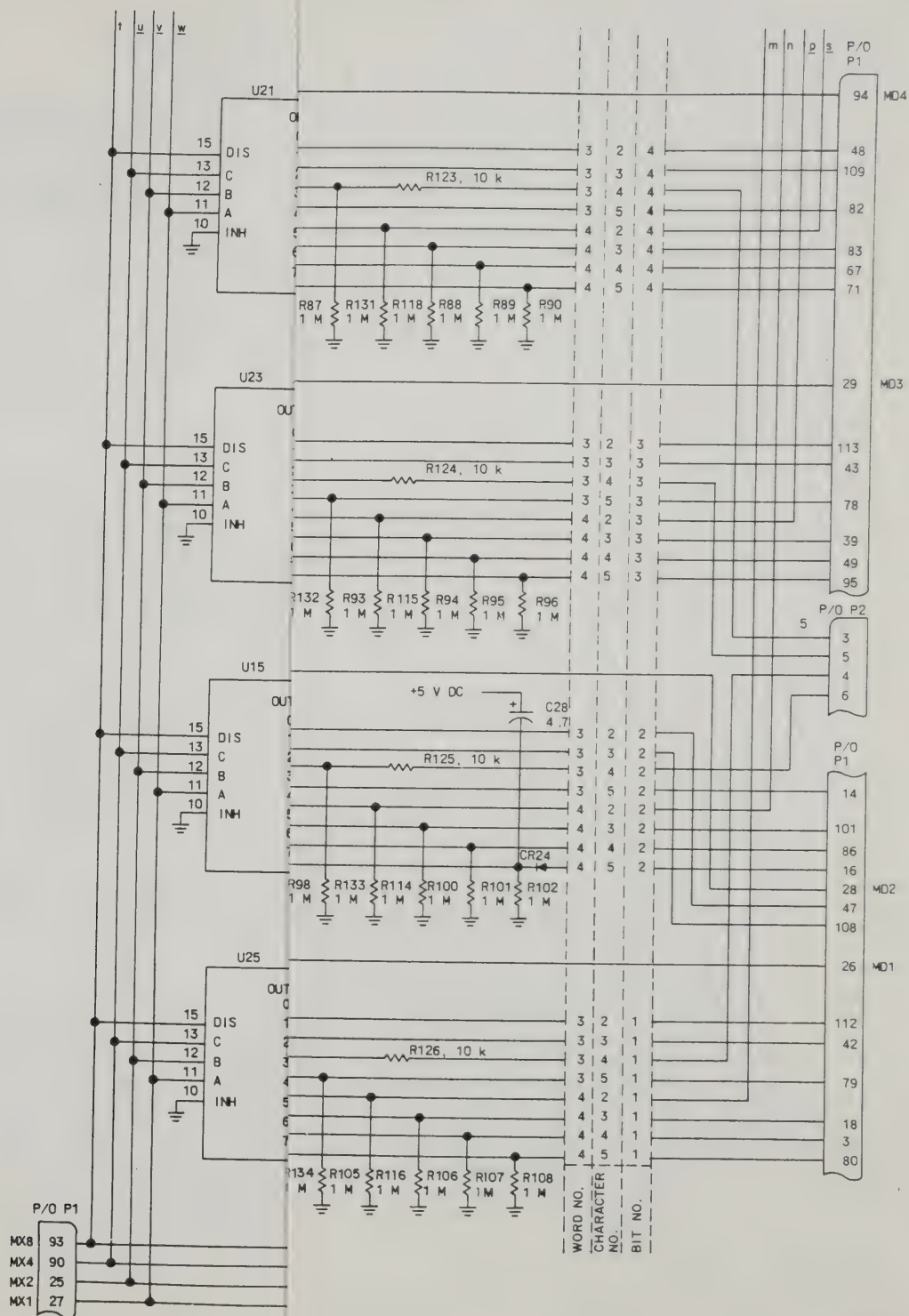


Parallel Input, Schematic Diagram
Figure 3 (Sheet 5)



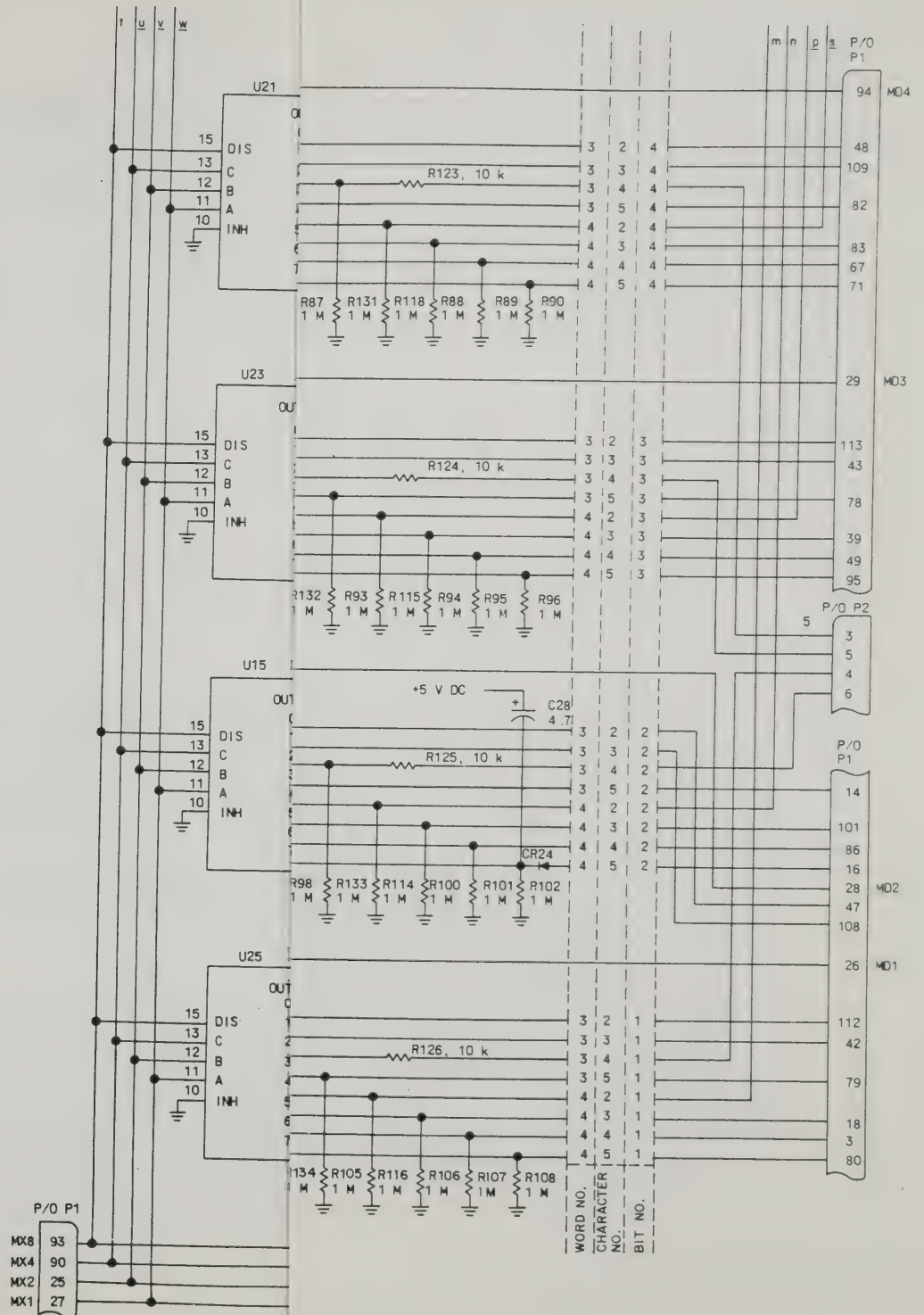
634-6909

Parallel Input, Schematic Diagram
Figure 3 (Sheet 6)



634-6909

Parallel Input, Schematic Diagram
Figure 3 (Sheet 6)



634-6909

Parallel Input, Schematic Diagram
Figure 3 (Sheet 6)



**Rockwell
International**

instructions

Collins Telecommunications Products Division

523-0770712-001211

1 January 1981

**Parallel Output
(642-3137-001)**

Parallel Output (642-3137-001)

Printed in USA

1. DESCRIPTION

Parallel Output 642-3137-001, shown in figure 1, is a 2-layer planar card with a 130-pin (2 layers, 65 pins each) edge-on connector. All test points are mounted at the top edge of the card for easy access with the card installed in the unit.

The parallel output card consists of 6 primary circuits: 16 serial-to-parallel shift registers (4 for each parallel output word), 4 power-on-clear flip-flops, a strobe multiplexer, an rf gain control, a fault indicator flasher, and an update/busy indicator/address gate (ADRG) generator.

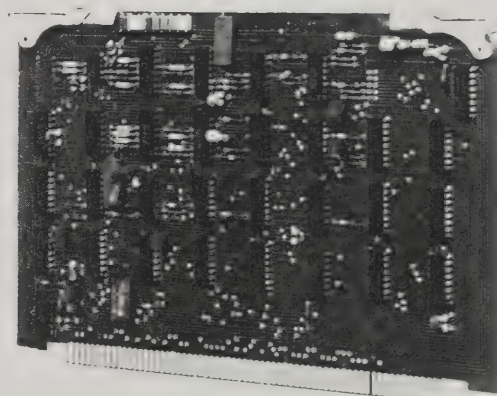
2. PRINCIPLES OF OPERATION (Refer to figure 2.)

2.1 General

The parallel output card receives the serial input data from the serial interface card. The shift registers convert the serial data to parallel outputs for application to front panel indicators. The rf gain control circuit is only used in the remote mode of the receiver circuits. The power-on-clear circuit initially sets all the outputs to clear. After initial turn-on, update, address gate, and busy indicator signals are continually generated for use by control unit circuits.

2.2 Power-On-Clear (Refer to figure 2 and figure 3, the schematic diagram.)

When power is applied to the parallel output card, the rc time constants of C15 and R28, and C19 and R37, generate a logic 1 voltage for approximately 1 second. These momentary logic 1's are applied to the set ter-



TPA-2838-017

*Parallel Output
Figure 1*

minals of flip-flops U5B, U17A, U17B, and U5A. The logic 1 at the set inputs drives the $\bar{Q}$ output to a logic 0. The logic 0 is applied to the enable lines of the 16 shift register, clearing all the shift registers to an initial open-circuit condition.

2.3 Serial-to-Parallel Shift Registers

The 16 shift registers are electronically arranged in 4 groups of 4. Each group of shift registers represents one word, each shift register represents one character of the word, and each register output represents one of the eight data bits of the word. (This information is shown in detail in the table of the schematic diagram (figure 3).)

When the local enable signal at P1-16 is logic 0, the enable input to all the shift registers is logic 1 which

523-0770712-001211

enables their operation. In this condition, the data input (P1-89) is applied to the character-5 register of each word group. The clock input (P1-88) clocks the data serially through each of the registers in a word group. When all 8 bits of characters 2 through 4 are loaded, a strobe signal at the register strobe inputs will cause the data to be stored in the registers. With the enable inputs at logic 1, the stored data is applied through buffers to the eight outputs of the shift registers.

Strobe signals to each of the word groups of registers are generated by multiplexer U7. Outputs from this 8-channel multiplexer are determined by the inputs to the A (STA 1) and B (STA 2) control inputs (P1-83 and -81).

2.4 Fault Indicator Flasher (Refer to figure 2 and the schematic diagram.)

Free-running astable multivibrator U8, positive edge trigger monostable multivibrator U32, and exclusive OR gate U12B develop an on-off (flash) signal to indicate a receiver-exciter fault. During normal operation, the strobe signal to the U32 retrigger input occurs at a rate that keeps the multivibrator continuously triggered. The output of U32 is connected to the external reset of U8. The output of U8 (a logic 1) is synchronized with the strobe signal and applied to exclusive OR gate U12B.

The other input to exclusive OR gate U12B is connected to either U16 or U15 using E6. When connected to U16, word 4, character 4, bit 1 (2-channel receiver/exciter fault bit) is applied to U12B. When connected to U15, word 4, character 2, bit 5 (4-channel receiver/exciter fault bit) is applied to U12B.

When the receiver/exciter fault bit is logic 0 and the output from multivibrator U8 is logic 1, a fault indication (logic 1) is produced at the output of exclusive OR gate U12B-4. Since multivibrator U8 is free-running, the fault indication will be an on-off (flashing) signal. A steady fault indication is provided at connector P1-105.

In the event a malfunction interrupts monitor data transmission between the control and remote units (interconnection interruption or serial interface card malfunction, for example) the strobe signal to the U32 retrigger input goes to logic 0 allowing multivibrator U8 to free run at a 0.25-Hz rate.

2.5 RF Gain Control (Refer to figure 2 and the schematic diagram.)

The rf gain control circuit develops a dc voltage output proportional to the binary input signals to mul-

tiplexers U2 and U10. Control input signals (pins A, B, and C) to the multiplexers are obtained from serial-to-parallel shift register U18. The various dc output levels are developed by changing the input resistors to U1A.

In the remote mode of operation, the inputs to U9A and B are at logic 0. The rf gain (U18-7) signal is logic 0; this causes multiplexer U10 to be enabled and U2 to be inhibited. When the rf gain level is adjusted to the point where the rf gain signal goes to logic 1, U10 is inhibited and U2 is enabled (through inverter U11E). Thus the various input resistor values are selected to control the dc output level from amplifiers U1A and U1B.

2.6 Update/Busy Indicator/Address Gate Generator

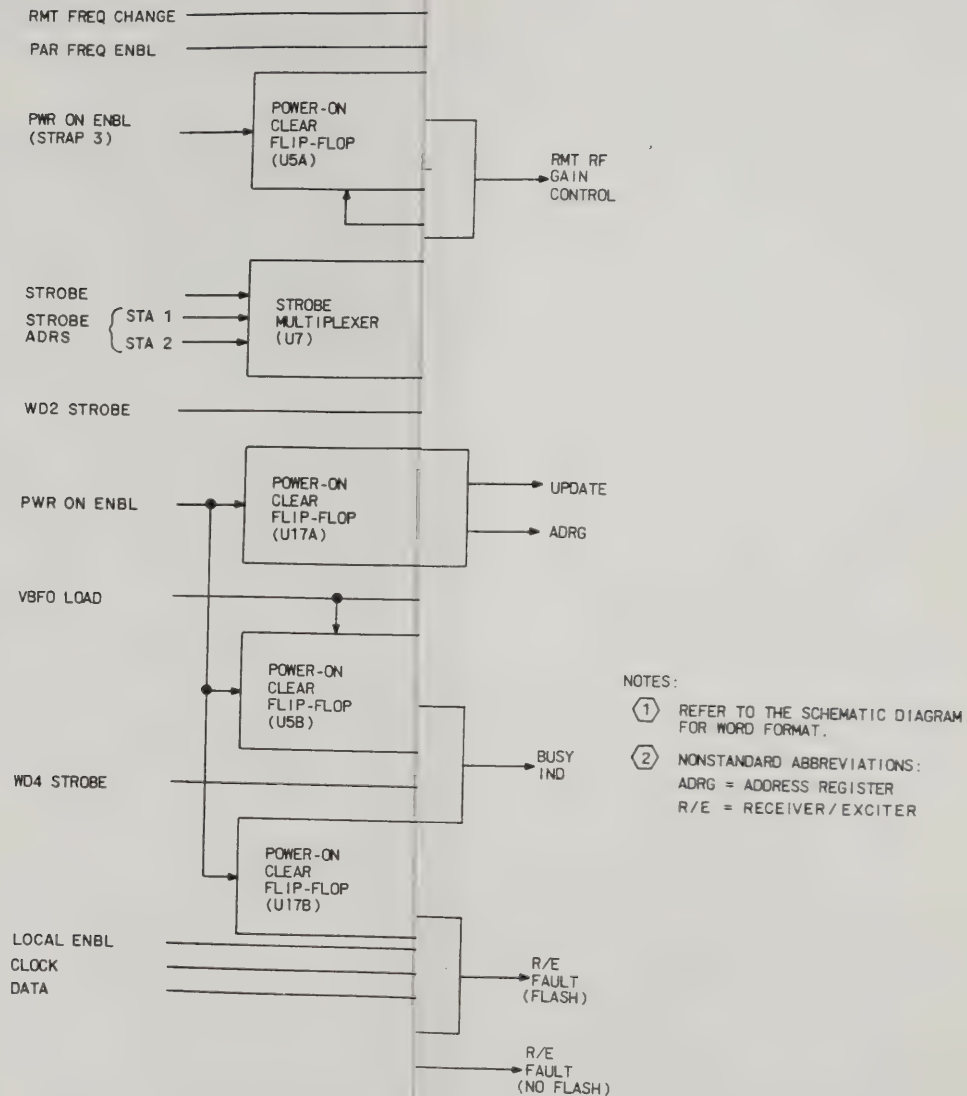
This circuit develops address gate and update pulses, and a driving voltage for the unit front-panel BUSY indicator. (These signals are used in the control unit only.)

With the unit front-panel CONT switch in NORM and no busy signal input from the unit being controlled, the input to U4A-1 is logic 0 and the input to U4A-2 is logic 1. This develops a logic 0 from exclusive OR gate U12D and AND gate U28B preventing the BUSY indicator on the unit front panel from lighting. This same signal is clocked through U20A to inhibit U28D from gating out WD4R pulses which are used as update requests.

When a busy signal input is received in the monitor data, the input to U4A-1 goes to logic 1. This develops a logic 1 to U28A-2 and to the busy indicator output causing the BUSY indicator to light and causing an output of continuous WD4R pulses as an address gate signal. The input to U28C-8 is logic 0 keeping the update output inhibited.

When the front panel CONT switch is changed from NORM to TEST in a not-busy condition, U4A-1 is logic 0 keeping the busy indicator output at logic 0. Switching from NORM to TEST causes U12C to develop a momentary output pulse that triggers U3A, causing a logic 0 output from U4B-4. This causes the exclusive OR gate to momentarily go to logic 1 and set U20A-1 to logic 1. The momentary logic 1 at U28D-13 permits one WD4R pulse to be gated out (P1-66) as an update pulse.

With a busy signal present (U4A-1 at logic 1) when the CONT switch is placed in the TEST position, the



TPA-2833-014

Parallel Output, Block Diagram
Figure 2

enables their operation. In this condition, the data input (P1-89) is applied to the character-5 register of each word group. The clock input (P1-88) clocks the data serially through each of the registers in a word group. When all 8 bits of characters 2 through 4 are loaded, a strobe signal at the register strobe inputs will cause the data to be stored in the registers. With the enable inputs at logic 1, the stored data is applied through buffers to the eight outputs of the shift registers.

Strobe signals to each of the word groups of registers are generated by multiplexer U7. Outputs from this 8-channel multiplexer are determined by the inputs to the A (STA 1) and B (STA 2) control inputs (P1-83 and -81).

2.4 Fault Indicator Flasher (Refer to figure 2 and the schematic diagram.)

Free-running astable multivibrator U8, positive edge trigger monostable multivibrator U32, and exclusive OR gate U12B develop an on-off (flash) signal to indicate a receiver-exciter fault. During normal operation, the strobe signal to the U32 retrigger input occurs at a rate that keeps the multivibrator continuously triggered. The output of U32 is connected to the external reset of U8. The output of U8 (a logic 1) is synchronized with the strobe signal and applied to exclusive OR gate U12B.

The other input to exclusive OR gate U12B is connected to either U16 or U15 using E6. When connected to U16, word 4, character 4, bit 1 (2-channel receiver/exciter fault bit) is applied to U12B. When connected to U15, word 4, character 2, bit 5 (4-channel receiver/exciter fault bit) is applied to U12B.

When the receiver/exciter fault bit is logic 0 and the output from multivibrator U8 is logic 1, a fault indication (logic 1) is produced at the output of exclusive OR gate U12B-4. Since multivibrator U8 is free-running, the fault indication will be an on-off (flashing) signal. A steady fault indication is provided at connector P1-105.

In the event a malfunction interrupts monitor data transmission between the control and remote units (interconnection interruption or serial interface card malfunction, for example) the strobe signal to the U32 retrigger input goes to logic 0 allowing multivibrator U8 to free run at a 0.25-Hz rate.

2.5 RF Gain Control (Refer to figure 2 and the schematic diagram.)

The rf gain control circuit develops a dc voltage output proportional to the binary input signals to mul-

tiplexers U2 and U10. Control input signals (pins A, B, and C) to the multiplexers are obtained from serial-to-parallel shift register U18. The various dc output levels are developed by changing the input resistors to U1A.

In the remote mode of operation, the inputs to U9A and B are at logic 0. The rf gain (U18-7) signal is logic 0; this causes multiplexer U10 to be enabled and U2 to be inhibited. When the rf gain level is adjusted to the point where the rf gain signal goes to logic 1, U10 is inhibited and U2 is enabled (through inverter U11E). Thus the various input resistor values are selected to control the dc output level from amplifiers U1A and U1B.

2.6 Update/Busy Indicator/Address Gate Generator

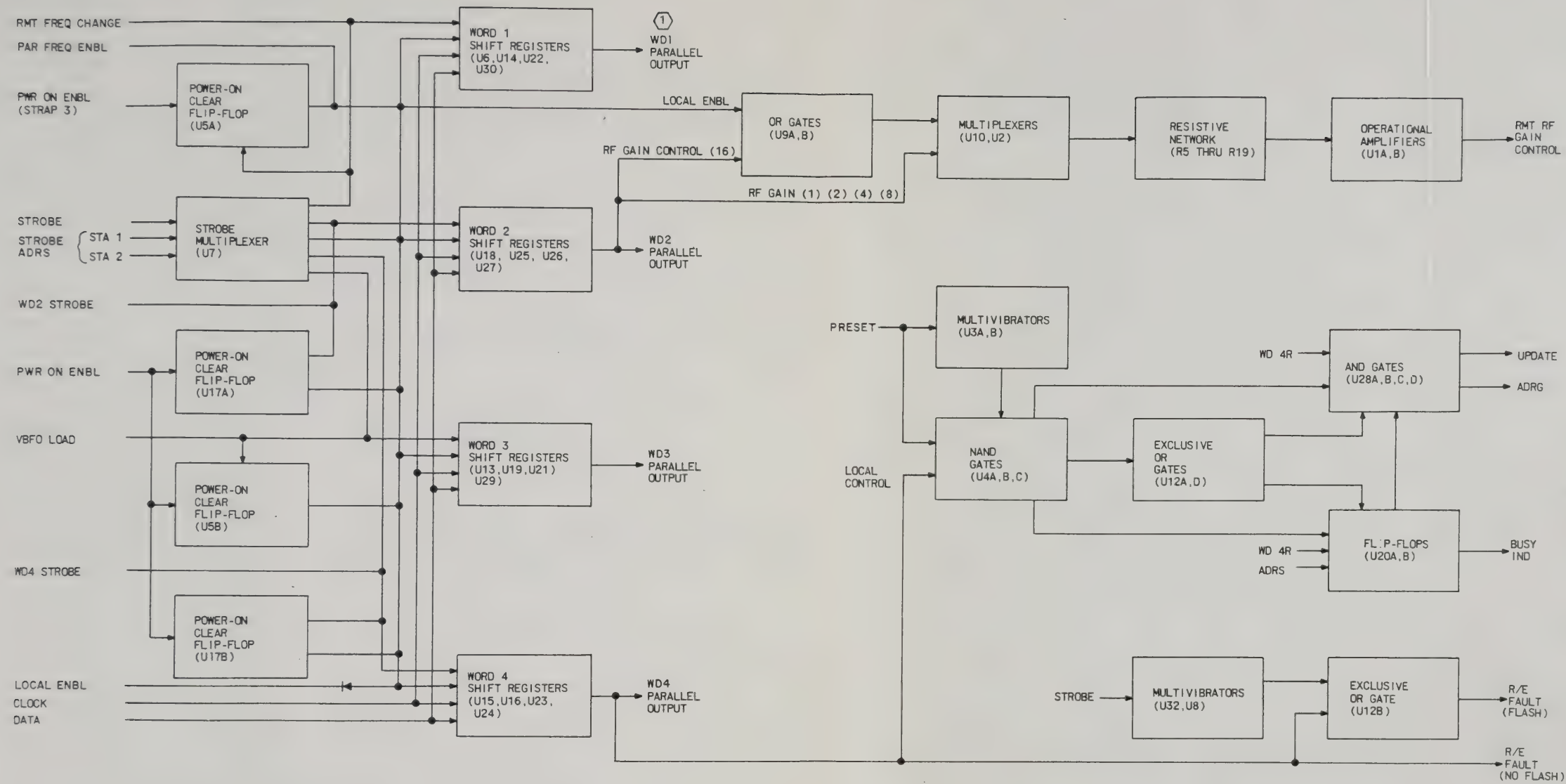
This circuit develops address gate and update pulses, and a driving voltage for the unit front-panel BUSY indicator. (These signals are used in the control unit only.)

With the unit front-panel CONT switch in NORM and no busy signal input from the unit being controlled, the input to U4A-1 is logic 0 and the input to U4A-2 is logic 1. This develops a logic 0 from exclusive OR gate U12D and AND gate U28B preventing the BUSY indicator on the unit front panel from lighting. This same signal is clocked through U20A to inhibit U28D from gating out WD4R pulses which are used as update requests.

When a busy signal input is received in the monitor data, the input to U4A-1 goes to logic 1. This develops a logic 1 to U28A-2 and to the busy indicator output causing the BUSY indicator to light and causing an output of continuous WD4R pulses as an address gate signal. The input to U28C-8 is logic 0 keeping the update output inhibited.

When the front panel CONT switch is changed from NORM to TEST in a not-busy condition, U4A-1 is logic 0 keeping the busy indicator output at logic 0. Switching from NORM to TEST causes U12C to develop a momentary output pulse that triggers U3A, causing a logic 0 output from U4B-4. This causes the exclusive OR gate to momentarily go to logic 1 and set U20A-1 to logic 1. The momentary logic 1 at U28D-13 permits one WD4R pulse to be gated out (P1-66) as an update pulse.

With a busy signal present (U4A-1 at logic 1) when the CONT switch is placed in the TEST position, the



- NOTES:
- 1 REFER TO THE SCHEMATIC DIAGRAM FOR WORD FORMAT.
 - 2 NONSTANDARD ABBREVIATIONS:
ADRG = ADDRESS REGISTER
R/E = RECEIVER/EXCITER

Parallel Output, Block Diagram
Figure 2

set pulse to U20A-6 is developed as previously described; however, the resulting logic 1 from U4A-3 causes U12D-11 to be logic 0. This switches off the front-panel BUSY indicator, and causes the Q output from U20A to go to logic 0. The resulting update output is one logic 1 pulse and the ADRG output is inhibited.

When the front-panel CONT switch is changed from TEST to NORM, the logic 1 output pulse from U3B-10 is developed as previously described. With a not-busy signal present, U4A-3 is logic 1 enabling U28C to gate the WD4R pulses to U28D. The logic 1 at U12D-13 inhibits gate U28B. The logic 0 output from U28B-4 is the BUSY indicator output, the D input to U20A, and an inhibiting input to U28A. The resulting Q output from U20A inhibits gate U28D, developing a logic 0 update output.

With a busy signal present when the CONT switch is set to NORM, U4A-3 is logic 0 which causes the update output to be logic 0. The logic 1 outputs a logic 1 BUSY indicator signal and enables gate U28A. The WD4R input to U28A-1 is then gated out as continuous ADRG pulses.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the parallel output card are

listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in tables 1 and 2 check the total performance of the parallel output card. The procedures in table 1 are for the following equipments:

HF-8010/8010A Exciter
HF-8050/8050A Receiver
HF-8070/8070A Receiver-Exciter
851S Receiver
HF-8090, HF-8091, HF-8092, and HF-8095 Controls.

The procedures in table 2 are for the following equipments:

HF-8014/8014A Exciter
HF-8054/8054A Receiver
HF-8093 and HF-8094 Controls.

These procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic diagram (figure 3) to trace the source of the fault.

Table 1. Parallel Output, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	Note The testing and troubleshooting procedures herein are for 1- or 2-channel configurations of the HF-8010/8010A, HF-8050/8050A, HF-8070/8070A, 851S, HF-8090, HF-8091, HF-8092, and HF-8095. These testing and troubleshooting procedures are based on using a control unit and an associated local unit. The most effective method of testing and troubleshooting is obtained by installing the questionable parallel output in the control unit. During these tests when a control unit is referred to it is a receiver-exciter control, or a receiver control. When a local unit is referred to it is a receiver-exciter, an exciter, or a receiver.		

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. (Cont)	a. Remove top cover of unit containing the parallel output that is to be tested. b. Remove parallel output. Strap pin pair E6 between middle and right pins. Install it on an extender card and place it in the control unit. c. Set control unit and local unit LINE SELECTOR switches to 115 V. d. Connect control unit and local unit to 115-V ac power source and set power on. e. Measure dc voltages, on the card under test, between the following pins and ground (TP1, brown): P1-45 P1-65 P1-114 f. Strap local unit for address 0. g. Connect local unit to control unit.	+15 $\pm$1.0 V dc. +5 $\pm$0.5 V dc. -15 $\pm$1.0 V dc.	Check associated power supply.
2. Data inputs, word 1	a. Set control unit CONT switch to TEST. Note Word 1 tests can also be accomplished with the control unit CONT switch in NORM and local unit CONT switch in LCL. Then set local unit controls to positions indicated. b. Set control unit FREQUENCY KHZ controls for 29 999.9(9).	Frequency display reads 29 999.9(9). Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.
(Cont)			

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																														
2. (Cont)	c. Set control unit FREQUENCY KHZ controls for 16 666.6(6).	Frequency display reads 16 666.6(6). Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																																														
	d. Set control unit FREQUENCY KHZ controls for 02 000.0(0).	Frequency display reads 02 000.0(0). Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																																														
	Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.																																																																																
	<table><tr><th rowspan="2">BCD OUTPUT SIGNAL</th><th rowspan="2">PARALLEL OUTPUT PIN NO</th><th colspan="3">LOGIC LEVELS</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>29 999.9(9)</th><th>16 666.6(6)</th><th>02 000.0(0)</th></tr><tr><td></td><td>P1-()</td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="2">10 MHz {</td><td>(2) 129</td><td>1</td><td>0</td><td>0</td><td rowspan="6">U6, U5, U7, U11, and associated circuits.</td></tr><tr><td>(1) 64</td><td>0</td><td>1</td><td>0</td></tr><tr><td rowspan="4">1 MHz {</td><td>(8) 128</td><td>1</td><td>0</td><td>0</td></tr><tr><td>(4) 63</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 127</td><td>0</td><td>1</td><td>1</td></tr><tr><td>(1) 62</td><td>1</td><td>0</td><td>0</td></tr><tr><td rowspan="4">100 kHz {</td><td>(8) 126</td><td>1</td><td>0</td><td>0</td><td rowspan="19">U14, U5, U7, U11, and associated circuits.</td></tr><tr><td>(4) 61</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 125</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(1) 60</td><td>1</td><td>0</td><td>0</td></tr><tr><td rowspan="4">10 kHz {</td><td>(8) 124</td><td>1</td><td>0</td><td>0</td></tr><tr><td>(4) 59</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 123</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(1) 58</td><td>1</td><td>0</td><td>0</td></tr></table>	BCD OUTPUT SIGNAL	PARALLEL OUTPUT PIN NO	LOGIC LEVELS			IF ABNORMAL CHECK	29 999.9(9)	16 666.6(6)	02 000.0(0)		P1-()					10 MHz {	(2) 129	1	0	0	U6, U5, U7, U11, and associated circuits.	(1) 64	0	1	0	1 MHz {	(8) 128	1	0	0	(4) 63	0	1	0	(2) 127	0	1	1	(1) 62	1	0	0	100 kHz {	(8) 126	1	0	0	U14, U5, U7, U11, and associated circuits.	(4) 61	0	1	0	(2) 125	0	1	0	(1) 60	1	0	0	10 kHz {	(8) 124	1	0	0	(4) 59	0	1	0	(2) 123	0	1	0	(1) 58	1	0	0			
BCD OUTPUT SIGNAL	PARALLEL OUTPUT PIN NO			LOGIC LEVELS				IF ABNORMAL CHECK																																																																									
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Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE			NORMAL INDICATION	IF INDICATION IS ABNORMAL	
2. (Cont)	BCD OUTPUT SIGNAL	PARALLEL OUTPUT PIN NO	LOGIC LEVELS			IF ABNORMAL CHECK
		P1-()	29 999.9(9)	16 666.6(6)	02 000.0(0)	
	1 kHz	(8) 122	1	0	0	U22, U5, U7, U11, and associated circuits.
		(4) 57	0	1	0	
		(2) 121	0	1	0	
		(1) 56	1	0	0	
	100 Hz	(8) 120	1	0	0	
		(4) 55	0	1	0	
		(2) 119	0	1	0	
		(1) 54	1	0	0	
	10 Hz (with no 10-Hz tuning)	(8) 118	0	0	0	U30, U5, U7, U11, and associated circuits.
		(4) 53	0	0	0	
		(2) 117	0	0	0	
		(1) 52	0	0	0	
	10 Hz (with 10-Hz tuning)	(8) 118	1	0	0	
		(4) 53	0	1	0	
		(2) 117	0	1	0	
		(1) 52	1	0	0	
	1 Hz (with no 1-Hz tuning)	(8) 116	0	0	0	U30, U5, U7, U11, and associated circuits.
		(4) 51	0	0	0	
		(2) 115	0	0	0	
		(1) 50	0	0	0	
	1 Hz (with 1-Hz tuning)	(8) 116	1	0	0	
		(4) 51	0	1	0	
		(2) 115	0	1	0	
		(1) 50	1	0	0	
Note If a processor control is used, the 1-Hz outputs can be checked in the same manner that the other frequency outputs are checked.						

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																				
3. Data inputs, word 2	a. Set control unit CONT switch to TEST. Note Word 2 tests can also be accomplished with the control unit CONT switch in NORM and local unit CONT switch in REM. Then measure voltages at local unit or control unit parallel output card (the card being tested). Rf gain test, steps b and c, is applicable to receiver and receiver-exciter controls only. b. Set control unit RF GAIN control to MAX. c. Connect a dvm to TP5 (green).	Note dc levels as shown in chart for different RF GAIN positions.	Check U18, U9, U11, U1, and associated circuits. Check also circuit indicated in chart.																																																																				
<table><tr><th colspan="2">RF GAIN CONTROL SETTINGS</th><th>TP5 (DC VOLTS)</th><th>IF ABNORMAL CHECK</th></tr><tr><td>MAX</td><td>1</td><td>0.000 ±0.010</td><td>None</td></tr><tr><td>↓</td><td>*</td><td>-0.158 ±0.010</td><td>R20</td></tr><tr><td></td><td>2</td><td>-0.316 ±0.010</td><td>R19</td></tr><tr><td></td><td>*</td><td>-0.475 ±0.020</td><td>R19, R20</td></tr><tr><td></td><td>3</td><td>-0.634 ±0.020</td><td>R18</td></tr><tr><td></td><td>*</td><td>-0.792 ±0.030</td><td>R18, R20</td></tr><tr><td>rotated from MAX</td><td>4</td><td>-0.950 ±0.030</td><td>R17</td></tr><tr><td>ccw toward</td><td>*</td><td>-1.108 ±0.040</td><td>R17, R20</td></tr><tr><td>MIN</td><td>5</td><td>-1.266 ±0.040</td><td>R16</td></tr><tr><td>↓</td><td>*</td><td>-1.417 ±0.050</td><td>R16, R20</td></tr><tr><td></td><td>6</td><td>-1.568 ±0.050</td><td>R15</td></tr><tr><td></td><td>*</td><td>-1.712 ±0.060</td><td>R15, R20</td></tr><tr><td></td><td>7</td><td>-1.855 ±0.060</td><td>R14</td></tr><tr><td></td><td>*</td><td>-2.022 ±0.070</td><td>R14, R20</td></tr><tr><td></td><td>8</td><td>-2.188 ±0.070</td><td>R13</td></tr><tr><td>MIN</td><td>*</td><td>-2.332 ±0.080</td><td>R13, R20</td></tr></table>				RF GAIN CONTROL SETTINGS		TP5 (DC VOLTS)	IF ABNORMAL CHECK	MAX	1	0.000 ±0.010	None	↓	*	-0.158 ±0.010	R20		2	-0.316 ±0.010	R19		*	-0.475 ±0.020	R19, R20		3	-0.634 ±0.020	R18		*	-0.792 ±0.030	R18, R20	rotated from MAX	4	-0.950 ±0.030	R17	ccw toward	*	-1.108 ±0.040	R17, R20	MIN	5	-1.266 ±0.040	R16	↓	*	-1.417 ±0.050	R16, R20		6	-1.568 ±0.050	R15		*	-1.712 ±0.060	R15, R20		7	-1.855 ±0.060	R14		*	-2.022 ±0.070	R14, R20		8	-2.188 ±0.070	R13	MIN	*	-2.332 ±0.080	R13, R20
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Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																				
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*Controlled by least significant bcd input for rf gain control, available only on processor controls. Bcd for least significant bcd signal at MAX setting is bit wt 0. Bcd signal for most significant bcd signal at one step beyond MIN setting is bit wt 31.																																																							
Note AGC tests, steps d through f, are applicable to the receiver and receiver-exciter controls only. d. Set control unit AGC switch to FAST. e. Set control unit AGC switch to OFF. f. Set control unit AGC switch to SLOW.																																																							
Check logic levels at the associated parallel output pin numbers as shown in chart. Check logic levels at the associated parallel output pin numbers as shown in chart. Check logic levels at the associated parallel output pin numbers as shown in chart.																																																							
(Cont)																																																							

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																														
3. (Cont)	Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc. <table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="3">AGC SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>FAST</th><th>OFF</th><th>SLOW</th></tr><tr><td>CH A AGC OFF</td><td>84</td><td>0</td><td>1</td><td>0</td><td rowspan="4">U26, U17, U7, U11, and associated circuits.</td></tr><tr><td>CH A AGC FAST</td><td>85</td><td>1</td><td>0</td><td>0</td></tr><tr><td>CH B AGC OFF</td><td>19</td><td>0</td><td>1</td><td>0</td></tr><tr><td>CH B AGC FAST</td><td>20</td><td>1</td><td>0</td><td>0</td></tr></table>	PARALLEL OUTPUT	PIN NO P1-()	AGC SWITCH POSITION			IF ABNORMAL CHECK	FAST	OFF	SLOW	CH A AGC OFF	84	0	1	0	U26, U17, U7, U11, and associated circuits.	CH A AGC FAST	85	1	0	0	CH B AGC OFF	19	0	1	0	CH B AGC FAST	20	1	0	0		
PARALLEL OUTPUT	PIN NO P1-()			AGC SWITCH POSITION				IF ABNORMAL CHECK																									
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(Cont)	Note Bandwidth tests, steps g and h, are applicable to the receiver control only. g. Set control unit MODE switch to SSB/CW. h. Set control unit BANDWIDTH switch to each of its positions. Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.	The display associated with the BANDWIDTH switch positions lights. Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																														

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																																																				
3. (Cont)	<table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="8">BANDWIDTH SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>16</th><th>A</th><th>B</th><th>USB</th><th>LSB</th><th>C</th><th>D</th><th>E</th></tr><tr><td>FL8</td><td>100</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td rowspan="8">U27, U17, U7, U11, and associated circuits.</td></tr><tr><td>FL3</td><td>33</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>FL4</td><td>98</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>FL1</td><td>32</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>FL2</td><td>97</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>FL5</td><td>34</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>FL6</td><td>35</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>FL7</td><td>99</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr></table>	PARALLEL OUTPUT	PIN NO P1-()	BANDWIDTH SWITCH POSITION								IF ABNORMAL CHECK	16	A	B	USB	LSB	C	D	E	FL8	100	1	0	0	0	0	0	0	0	U27, U17, U7, U11, and associated circuits.	FL3	33	0	1	0	0	0	0	0	0	FL4	98	0	0	1	0	0	0	0	0	FL1	32	0	0	0	1	0	0	0	0	FL2	97	0	0	0	0	1	0	0	0	FL5	34	0	0	0	0	0	1	0	0	FL6	35	0	0	0	0	0	0	1	0	FL7	99	0	0	0	0	0	0	0	1		
PARALLEL OUTPUT	PIN NO P1-()			BANDWIDTH SWITCH POSITION									IF ABNORMAL CHECK																																																																																										
		16	A	B	USB	LSB	C	D	E																																																																																														
FL8	100	1	0	0	0	0	0	0	0	U27, U17, U7, U11, and associated circuits.																																																																																													
FL3	33	0	1	0	0	0	0	0	0																																																																																														
FL4	98	0	0	1	0	0	0	0	0																																																																																														
FL1	32	0	0	0	1	0	0	0	0																																																																																														
FL2	97	0	0	0	0	1	0	0	0																																																																																														
FL5	34	0	0	0	0	0	1	0	0																																																																																														
FL6	35	0	0	0	0	0	0	1	0																																																																																														
FL7	99	0	0	0	0	0	0	0	1																																																																																														
(Cont)	Note Mode tests, step i, are applicable to the receiver control only. i. Set MODE switch (receiver control only) to each of its positions. Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.	The display associated with the MODE switch position lights. Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																																																																				

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE				NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	PARALLEL OUTPUT	PIN NO P1-()	MODE SWITCH POSITION			IF ABNORMAL CHECK
			*SSB/CW	*AM	ISB	
	SSB EN	72	1	0	1	} U25, U17, U7, U11, and associated circuits.
	AM EN	8	0	1	0	
	FM EN	73	0	0	0	
	CW EN	9	0	0	0	
	ISB EN	74	0	0	1	
	*In these positions the display and logic levels associated with the BANDWIDTH switch position are also activated.					
	Note Mode tests, step j, are applicable to the exciter and receiver-exciter controls only. j. Set MODE switch (exciter and receiver-exciter controls only) to each of its positions. Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.				The display associated with the MODE switch position lights. Refer to chart for logic levels and associated parallel output pin numbers.	
	(Cont)					

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																
3. (Cont)	<table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="5">MODE SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>CW</th><th>LSB</th><th>USB</th><th>AM</th><th>ISB</th></tr><tr><td>SSB EN</td><td>72</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td rowspan="4">U25, U17, U7, U11, and associated circuits.</td></tr><tr><td>AM EN</td><td>8</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>FM EN</td><td>73</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>CW EN</td><td>9</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>ISB EN</td><td>74</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td rowspan="3">U27, U17, U7, U11, and associated circuits.</td></tr><tr><td>FL1 (USB) EN</td><td>32</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>FL2 (LSB) EN</td><td>97</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr></table>	PARALLEL OUTPUT	PIN NO P1-()	MODE SWITCH POSITION					IF ABNORMAL CHECK	CW	LSB	USB	AM	ISB	SSB EN	72	1	1	1	0	1	U25, U17, U7, U11, and associated circuits.	AM EN	8	0	0	0	1	0	FM EN	73	0	0	0	0	0	CW EN	9	1	0	0	0	0	ISB EN	74	0	0	0	0	1	U27, U17, U7, U11, and associated circuits.	FL1 (USB) EN	32	0	0	1	0	0	FL2 (LSB) EN	97	0	1	0	0	0		
	PARALLEL OUTPUT			PIN NO P1-()	MODE SWITCH POSITION					IF ABNORMAL CHECK																																																									
		CW	LSB		USB	AM	ISB																																																												
	SSB EN	72	1	1	1	0	1	U25, U17, U7, U11, and associated circuits.																																																											
	AM EN	8	0	0	0	1	0																																																												
	FM EN	73	0	0	0	0	0																																																												
	CW EN	9	1	0	0	0	0																																																												
	ISB EN	74	0	0	0	0	1	U27, U17, U7, U11, and associated circuits.																																																											
	FL1 (USB) EN	32	0	0	1	0	0																																																												
	FL2 (LSB) EN	97	0	1	0	0	0																																																												
4. Data inputs, word 3	a. Set control unit CONT switch to TEST. Note Word 3 tests can also be accomplished with control unit CONT switch in NORM and local unit CONT switch in REM. Then measure voltages at local unit parallel output card (the card being tested). Pa tests, steps b through e, are applicable to the exciter and receiver-exciter controls only.																																																																		
	b. Set control unit PA PWR switch to OFF.	Check logic levels at the associated parallel output pin numbers as shown in chart.																																																																	
	c. Set control unit PA PWR switch to STBY.	Check logic levels at the associated parallel output pin numbers as shown in chart.																																																																	
	d. Set control unit PA PWR switch to HIGH PWR.	Check logic levels at the associated parallel output pin numbers as shown in chart.																																																																	
	(Cont)																																																																		

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																											
4. (Cont)	e. Set control unit PA PWR switch to LOW PWR. Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.	Check logic levels at the associated parallel output pin numbers as shown in chart.																												
	<table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="4">PA PWR SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>OFF</th><th>STBY</th><th>HIGH PWR</th><th>LOW PWR</th></tr><tr><td>PA LV EN</td><td>79</td><td>0</td><td>1</td><td>1</td><td>1</td><td rowspan="3">U19, U5, U7, U11, and associated circuits.</td></tr><tr><td>PA HV EN</td><td>14</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>LO PWR EN</td><td>78</td><td>0</td><td>0</td><td>0</td><td>1</td></tr></table>			PARALLEL OUTPUT	PIN NO P1-()	PA PWR SWITCH POSITION				IF ABNORMAL CHECK	OFF	STBY	HIGH PWR	LOW PWR	PA LV EN	79	0	1	1	1	U19, U5, U7, U11, and associated circuits.	PA HV EN	14	0	0	1	1	LO PWR EN	78	0
PARALLEL OUTPUT	PIN NO P1-()	PA PWR SWITCH POSITION				IF ABNORMAL CHECK																								
		OFF	STBY	HIGH PWR	LOW PWR																									
PA LV EN	79	0	1	1	1	U19, U5, U7, U11, and associated circuits.																								
PA HV EN	14	0	0	1	1																									
LO PWR EN	78	0	0	0	1																									
(Cont)	Note Pilot carrier tests, steps f and g, are applicable to the exciter and receiver-exciter controls only. f. Set control unit P CAR switch to OFF. g. Set control unit P CAR switch to ON. Note Dvbfo tests, steps h through k, are applicable only to the receiver and receiver-exciter controls with a dvbfo option installed. h. Set the control unit MODE switch to SSB/CW or CW and BFO switch to VAR.	Logic level 0 at P1-82 (NMT 0.5 V dc). Logic level 1 at P1-82 (NLT +3.0 V dc).	Check U19, U5, U7, U11, and associated circuits.																											

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																							
4. (Cont)	i. Set digital VBFO controls for +9990 Hz.	VBFO frequency display reads +9990. Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																																							
	j. Set digital VBFO controls for -6660 Hz.	VBFO frequency display reads -6660. Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																																							
	k. Set digital VBFO controls for +1000 Hz.	VBFO frequency display reads +1000. Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																																							
	Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.																																																																									
<table><tr><th rowspan="2">BCD OUTPUT SIGNAL</th><th rowspan="2">PARALLEL OUTPUT PIN NO</th><th colspan="3">LOGIC LEVELS</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>+9990</th><th>-6660</th><th>+1000</th></tr><tr><td rowspan="4">DVBFO 1 kHz</td><td>P1-()</td><td></td><td></td><td></td><td rowspan="4">U29, U5, U7, U11, and associated circuits.</td></tr><tr><td>(8) 48</td><td>1</td><td>0</td><td>0</td></tr><tr><td>(4) 113</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 47</td><td>0</td><td>1</td><td>0</td></tr><tr><td rowspan="4">DVBFO 100 Hz</td><td>(1) 112</td><td>1</td><td>0</td><td>1</td><td rowspan="12">U21, U5, U7, U11, and associated circuits.</td></tr><tr><td>(8) 46</td><td>1</td><td>0</td><td>0</td></tr><tr><td>(4) 111</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 110</td><td>0</td><td>1</td><td>0</td></tr><tr><td rowspan="4">DVBFO 10 Hz</td><td>(1) 44</td><td>1</td><td>0</td><td>0</td></tr><tr><td>(8) 109</td><td>1</td><td>0</td><td>0</td></tr><tr><td>(4) 43</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 108</td><td>0</td><td>1</td><td>0</td></tr><tr><td rowspan="2">DVBFO SIGN</td><td>(1) 42</td><td>1</td><td>0</td><td>0</td></tr><tr><td>107</td><td>1</td><td>0</td><td>1</td></tr></table>				BCD OUTPUT SIGNAL	PARALLEL OUTPUT PIN NO	LOGIC LEVELS			IF ABNORMAL CHECK	+9990	-6660	+1000	DVBFO 1 kHz	P1-()				U29, U5, U7, U11, and associated circuits.	(8) 48	1	0	0	(4) 113	0	1	0	(2) 47	0	1	0	DVBFO 100 Hz	(1) 112	1	0	1	U21, U5, U7, U11, and associated circuits.	(8) 46	1	0	0	(4) 111	0	1	0	(2) 110	0	1	0	DVBFO 10 Hz	(1) 44	1	0	0	(8) 109	1	0	0	(4) 43	0	1	0	(2) 108	0	1	0	DVBFO SIGN	(1) 42	1	0	0	107	1	0	1
BCD OUTPUT SIGNAL	PARALLEL OUTPUT PIN NO	LOGIC LEVELS				IF ABNORMAL CHECK																																																																				
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	(8) 48	1	0	0																																																																						
	(4) 113	0	1	0																																																																						
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DVBFO 100 Hz	(1) 112	1	0	1	U21, U5, U7, U11, and associated circuits.																																																																					
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	107	1	0	1																																																																						
(Cont)																																																																										

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																																																																
4. (Cont)	Note Analog vbfo tests, steps l and m, are applicable only to the receiver and receiver-exciter controls with an analog vbfo option installed. l. Set the control unit MODE switch to SSB/CW or CW and BFO switch to VAR. m. Rotate the BFO control through its complete range.	Check logic levels at the associated parallel output pin numbers as shown in chart.																																																																																																																	
<table><tr><th rowspan="3">BCD OUTPUT SIGNAL</th><th colspan="4">LOGIC LEVELS</th><th rowspan="3">LOGIC DISPLAY</th><th rowspan="3">IF ABNORMAL CHECK</th></tr><tr><th colspan="4">PARALLEL OUTPUT PIN NO P1-()</th></tr><tr><th>48</th><th>113</th><th>47</th><th>112</th></tr><tr><td rowspan="16"> - (Full ccw) 1 ↓ Rotated from - cw toward + ↓ + (Full cw) 16 </td><td>1</td><td>1</td><td>1</td><td>1</td><td></td><td rowspan="16">U29, U5, U7, U11, and associated circuits.</td></tr><tr><td>2</td><td>1</td><td>1</td><td>1</td><td>0</td><td></td></tr><tr><td>3</td><td>1</td><td>1</td><td>0</td><td>1</td><td></td></tr><tr><td>4</td><td>1</td><td>1</td><td>0</td><td>0</td><td></td></tr><tr><td>5</td><td>1</td><td>0</td><td>1</td><td>1</td><td></td></tr><tr><td>6</td><td>1</td><td>0</td><td>1</td><td>0</td><td></td></tr><tr><td>7</td><td>1</td><td>0</td><td>0</td><td>1</td><td></td></tr><tr><td>8</td><td>1</td><td>0</td><td>0</td><td>0</td><td></td></tr><tr><td>9</td><td>0</td><td>1</td><td>1</td><td>1</td><td></td></tr><tr><td>10</td><td>0</td><td>1</td><td>1</td><td>0</td><td></td></tr><tr><td>11</td><td>0</td><td>1</td><td>0</td><td>1</td><td></td></tr><tr><td>12</td><td>0</td><td>1</td><td>0</td><td>0</td><td></td></tr><tr><td>13</td><td>0</td><td>0</td><td>1</td><td>1</td><td></td></tr><tr><td>14</td><td>0</td><td>0</td><td>1</td><td>0</td><td></td></tr><tr><td>15</td><td>0</td><td>0</td><td>0</td><td>1</td><td></td></tr><tr><td>16</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td></tr></table>				BCD OUTPUT SIGNAL	LOGIC LEVELS				LOGIC DISPLAY	IF ABNORMAL CHECK	PARALLEL OUTPUT PIN NO P1-()				48	113	47	112	- (Full ccw) 1 ↓ Rotated from - cw toward + ↓ + (Full cw) 16	1	1	1	1		U29, U5, U7, U11, and associated circuits.	2	1	1	1	0		3	1	1	0	1		4	1	1	0	0		5	1	0	1	1		6	1	0	1	0		7	1	0	0	1		8	1	0	0	0		9	0	1	1	1		10	0	1	1	0		11	0	1	0	1		12	0	1	0	0		13	0	0	1	1		14	0	0	1	0		15	0	0	0	1		16	0	0	0	0	
BCD OUTPUT SIGNAL	LOGIC LEVELS				LOGIC DISPLAY	IF ABNORMAL CHECK																																																																																																													
	PARALLEL OUTPUT PIN NO P1-()																																																																																																																		
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- (Full ccw) 1 ↓ Rotated from - cw toward + ↓ + (Full cw) 16	1	1	1	1		U29, U5, U7, U11, and associated circuits.																																																																																																													
	2	1	1	1	0																																																																																																														
	3	1	1	0	1																																																																																																														
	4	1	1	0	0																																																																																																														
	5	1	0	1	1																																																																																																														
	6	1	0	1	0																																																																																																														
	7	1	0	0	1																																																																																																														
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	10	0	1	1	0																																																																																																														
	11	0	1	0	1																																																																																																														
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	15	0	0	0	1																																																																																																														
	16	0	0	0	0																																																																																																														

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. Data inputs, word 4	a. Set control unit CONT switch to NORM. b. Set local unit CONT switch to LCL. Note System key test, steps c and d, is applicable only to exciter and receiver-exciter controls. c. Set local unit KEY switch to LOCK. d. Set local unit KEY switch to NORM. e. Set local unit PWR switch off and back on. f. Change any frequency control on local unit front panel. Note Receive overload test, steps g and h, is applicable only to receiver and receiver-exciter controls. g. Connect +5 V dc to local unit J16-27. h. Remove +5 V dc from local unit J16-27. Note Coupler fault test, steps i and j, is applicable only to exciter and receiver-exciter controls.	Control unit KEY display lights. Logic level 1 at P1-68 (NLT +3.0 V dc). Control unit KEY display goes out. Logic level 0 at P1-68 (NMT 0.5 V dc). Control unit EXCTR FAULT, RCV FAULT, or R/E FAULT lights. Logic level 1 at P1-12 (NLT +3.0 V dc). Control unit EXCTR FAULT, RCV FAULT, or R/E FAULT goes out. Logic level 0 at P1-12 (NMT 0.5 V dc). Control unit RCV OVERLOAD lights. Logic level 1 at P1-67 (NLT +3.0 V dc). Control unit RCV OVERLOAD goes out. Logic level 0 at P1-67 (NMT 0.5 V dc).	Check U15, U17, U7, U11, and associated circuits. Check U16, U12, U32, U8, U17, U7, U11, and associated circuits. Check U16, U17, U7, U11, and associated circuits. Same as step g.

(Cont)

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	i. Connect +5 V dc to local unit J15-1. j. Remove +5 V dc from local unit J15-1. Note Rf out test, steps k and l, is applicable only to exciter and receiver-exciter controls. k. Connect ground signal to local unit J15-5. l. Remove ground signal from local unit J15-5. Note Pa fault test, steps m and n, is applicable only to exciter and receiver-exciter controls. m. Connect +5 V dc to local unit J15-3. n. Remove +5 V dc from local unit J15-3. Note Pa ready test, steps o and p, is applicable only to exciter and receiver-exciter controls. o. Connect ground signal to local unit J15-21.	Control unit COUPLER FAULT lights. Logic level 1 at P1-13 (NLT +3.0 V dc). Control unit COUPLER FAULT lights. Logic level 0 at P1-13 (NMT 0.5 V dc). Control unit RF OUT lights. Logic level 1 at P1-5 (NLT +3.0 V dc). Control unit RF OUT goes out. Logic level 0 at P1-5 (NMT 0.5 V dc). Control unit PA FAULT lights. Logic level 1 at P1-77 (NLT +3.0 V dc). Control unit PA FAULT goes out. Logic level 0 at P1-77 (NMT 0.5 V dc). Control unit PA READY lights. Logic level 0 at P1-69 (NMT 0.5 V dc).	Same as step g.
(Cont)			

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	p. Remove ground signal from local unit J15-21. q. Press and hold local unit CONT switch to MON. r. Set local unit CONT switch to REM. s. Set local unit CONT switch to LCL. t. Set local unit CONT switch to REM. u. Set local unit CONT switch to LCL. v. Apply a ground to local unit A13U51A-6. w. Apply a ground to local unit A13U51A-3. x. Remove ground from local unit A13U51A-3. y. Apply ground to local unit A13U16A-1, 2, 8. z. Remove ground from local unit A13U16A-1, 2, 8. aa. Remove ground from local unit A13U51A-6. ab. Apply ground to local unit A13U42A-3.	Control unit PA READY goes out. Logic level 0 at P1-69 (NMT 0.5 V dc). Logic level 1 at P1-30 (NLT +3.0 V dc). Logic level 0 at P1-30 (NMT 0.5 V dc). Logic level 1 at P1-95 (NLT +3.0 V dc). Control unit BUSY indicator lights. Logic level 1 at P1-7 (NLT +3.0 V dc). After short delay logic level 0 at P1-95 (NMT 0.5 V dc). After short delay control unit BUSY indicator goes out. Logic level 0 at P1-7 (NMT 0.5 V dc). Logic level 1 at P1-29 (NLT +3.0 V dc). Logic level 0 at P1-29 (NMT 0.5 V dc).	Same as step g. Check U24, U17, U7, U11, and associated circuits. Check U28, U20, U12, U4, U24, U17, U7, U11, and associated circuits. Same as step s. Same as step q.
(Cont)			

Table 1. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	ac. Remove ground from local unit A13U42A-3. ad. Apply +5 V dc to local unit J16-8. ae. Remove +5 V dc from local unit J16-8.	Control unit PRESEL FAULT lights. Logic level 1 at P1-28 (NLT +3.0 V dc). Control unit PRESEL FAULT goes out. Logic level 0 at P1-28 (NMT 0.5 V dc).	Same as step q.

Table 2. Parallel Output, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	Note The testing and troubleshooting procedures herein are for 1-, 2-, 3-, and 4-channel configurations of the HF-8014/8014A, HF-8054/8054A, HF-8093, and HF-8094 These testing and troubleshooting procedures are based on using a control unit and an associated local unit. The most effective method of testing and troubleshooting is obtained by installing the questionable parallel output in the control unit. During these tests when a control unit is referred to it is an exciter control, or a receiver control. When a local unit is referred to it is an exciter, or a receiver. - Remove top cover of unit containing the parallel output that is to be tested. - Remove parallel output. Strap pin pair E6 between middle and left pins. Install it on an extender card and place it in the control unit. - Set control unit and local unit LINE SELECTOR switches to 115 V. - Connect control unit and local unit to 115-V ac power source and set power on. - Measure dc voltages, on the card under test, between the following pins and ground (TP1, brown): - P1-45 - P1-65 - P1-114 - Strap local unit for address 0. - Connect local unit to control unit.	+15 $\pm$1.0 V dc. +5 $\pm$0.5 V dc. -15 $\pm$1.0 V dc.	Check associated power supply.
2. Data inputs, word 1	- Set control unit CONT switch to TEST. Note Word 1 tests can also be accomplished with the control unit CONT switch in NORM and local unit CONT switch in LCL. Then set local unit controls to positions indicated. - Set control unit FREQUENCY KHZ controls for 29 999.9(9).	Frequency display reads 29 999.9(9). Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.
(Cont)			

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																									
2. (Cont)	c. Set control unit FREQUENCY KHZ controls for 16 666.6(6).	Frequency display reads 16 666.6(6). Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																																									
	d. Set control unit FREQUENCY KHZ controls for 02 000.0(0).	Frequency display reads 02 000.0(0). Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																																									
	Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.																																																																											
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Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

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3. Data inputs, word 2	a. Set control unit CONT switch to TEST. <i>Note</i> Word 2 tests can also be accomplished with the control unit CONT switch in NORM and local unit CONT switch in REM. Then measure voltages at local unit or control unit parallel output card (the card being tested). Rf gain test, steps b and c, is applicable to receiver controls only. b. Set control unit RF GAIN control to MAX. c. Connect a dvm to TP5 (green).	Note dc levels as shown in chart for different RF GAIN positions.	Check U18, U9, U11, U1, and associated circuits. Check also circuit indicated in chart.																																																																	
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(Cont)	Note AGC tests, steps d through f, are applicable to the receiver controls only. d. Set channel A1 AGC BUS switch to ON. e. Rotate channel A1 AGC control switch through all its positions. f. Repeat steps d and e for channels A2, B1, and B2.	Check logic levels at the associated parallel output pin numbers as shown in chart. Check logic levels at the associated parallel output pin numbers as shown in chart. Check logic levels at the associated parallel output pin numbers as shown in chart.																																																																									

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

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3. (Cont)	Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc. <table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="4">AGC SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>OFF</th><th>FAST</th><th>MEDIUM</th><th>SLOW</th></tr><tr><td>CH A1 AGC 1</td><td>32</td><td>1</td><td>0</td><td>0</td><td>1</td><td rowspan="8">Check U26, U27, &17, U7, U11, and associated circuits.</td></tr><tr><td>CH A1 AGC 2</td><td>97</td><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>CH A2 AGC 1</td><td>20</td><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>CH A2 AGC 2</td><td>19</td><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>CH B1 AGC 1</td><td>33</td><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>CH B1 AGC 2</td><td>98</td><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>CH B2 AGC 1</td><td>85</td><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>CH B2 AGC 2</td><td>84</td><td>1</td><td>0</td><td>1</td><td>0</td></tr></table>	PARALLEL OUTPUT	PIN NO P1-()	AGC SWITCH POSITION				IF ABNORMAL CHECK	OFF	FAST	MEDIUM	SLOW	CH A1 AGC 1	32	1	0	0	1	Check U26, U27, &17, U7, U11, and associated circuits.	CH A1 AGC 2	97	1	0	1	0	CH A2 AGC 1	20	1	0	0	1	CH A2 AGC 2	19	1	0	1	0	CH B1 AGC 1	33	1	0	0	1	CH B1 AGC 2	98	1	0	1	0	CH B2 AGC 1	85	1	0	0	1	CH B2 AGC 2	84	1	0	1	0		
PARALLEL OUTPUT	PIN NO P1-()			AGC SWITCH POSITION					IF ABNORMAL CHECK																																																						
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CH A2 AGC 1	20	1	0	0	1																																																										
CH A2 AGC 2	19	1	0	1	0																																																										
CH B1 AGC 1	33	1	0	0	1																																																										
CH B1 AGC 2	98	1	0	1	0																																																										
CH B2 AGC 1	85	1	0	0	1																																																										
CH B2 AGC 2	84	1	0	1	0																																																										
(Cont)	Note Bandwidth tests, steps g and h, are applicable to the receiver control only. g. Set control unit MODE switch to SSB/CW. h. Set control unit BANDWIDTH switch to each of its positions. Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.	The display associated with the BANDWIDTH switch positions lights. Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.																																																												

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																																																				
3. (Cont)	<table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="8">BANDWIDTH SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>16</th><th>A</th><th>B</th><th></th><th></th><th>C</th><th>D</th><th>E</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="7">U26, U27, U17, U7, U11, and associated circuits.</td></tr><tr><td>FL3</td><td>100</td><td>0</td><td>1</td><td>0</td><td></td><td></td><td>0</td><td>0</td><td>0</td></tr><tr><td>FL4</td><td>37</td><td>0</td><td>0</td><td>1</td><td></td><td></td><td>0</td><td>0</td><td>0</td></tr><tr><td>FL1</td><td>99</td><td>1</td><td>0</td><td>0</td><td></td><td></td><td>0</td><td>0</td><td>0</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>FL5</td><td>106</td><td>0</td><td>0</td><td>0</td><td></td><td></td><td>1</td><td>0</td><td>0</td></tr><tr><td>FL6</td><td>41</td><td>0</td><td>0</td><td>0</td><td></td><td></td><td>0</td><td>1</td><td>0</td></tr><tr><td>FL7</td><td>3</td><td>0</td><td>0</td><td>0</td><td></td><td></td><td>0</td><td>0</td><td>1</td></tr></table>	PARALLEL OUTPUT	PIN NO P1-()	BANDWIDTH SWITCH POSITION								IF ABNORMAL CHECK	16	A	B			C	D	E										U26, U27, U17, U7, U11, and associated circuits.	FL3	100	0	1	0			0	0	0	FL4	37	0	0	1			0	0	0	FL1	99	1	0	0			0	0	0											FL5	106	0	0	0			1	0	0	FL6	41	0	0	0			0	1	0	FL7	3	0	0	0			0	0	1	Note Mode tests, step i, are applicable to the receiver control only. i. Set MODE switch (receiver control only) to each of its positions.	The display associated with the MODE switch position lights. Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart.
	PARALLEL OUTPUT			PIN NO P1-()	BANDWIDTH SWITCH POSITION								IF ABNORMAL CHECK																																																																																										
		16	A		B			C	D	E																																																																																													
										U26, U27, U17, U7, U11, and associated circuits.																																																																																													
	FL3	100	0	1	0			0	0		0																																																																																												
	FL4	37	0	0	1			0	0		0																																																																																												
	FL1	99	1	0	0			0	0		0																																																																																												
	FL5	106	0	0	0			1	0		0																																																																																												
	FL6	41	0	0	0			0	1		0																																																																																												
FL7	3	0	0	0			0	0	1																																																																																														
<table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="4">MODE SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>NET DATA</th><th>*CW</th><th>*AM</th><th>ISB</th></tr><tr><td>AM EN</td><td>8</td><td>0</td><td>0</td><td>1</td><td>0</td><td rowspan="4">U25, U17, U7, U11, and associated circuits.</td></tr><tr><td>DATA NET EN</td><td>73</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>CW EN</td><td>72</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>ISB EN</td><td>9</td><td>0</td><td>0</td><td>0</td><td>1</td></tr></table> *In these positions the display and logic levels associated with the BANDWIDTH switch position are also activated.	PARALLEL OUTPUT	PIN NO P1-()	MODE SWITCH POSITION				IF ABNORMAL CHECK	NET DATA	*CW	*AM	ISB	AM EN	8	0	0	1	0	U25, U17, U7, U11, and associated circuits.	DATA NET EN	73	1	0	0	0	CW EN	72	0	1	0	0	ISB EN	9	0	0	0	1	Note Mode tests, step j, are applicable to the exciter controls only. j. Set MODE switch (exciter controls only) to each of its positions.	The display associated with the MODE switch position lights. Refer to chart for logic levels and																																																																	
PARALLEL OUTPUT			PIN NO P1-()	MODE SWITCH POSITION				IF ABNORMAL CHECK																																																																																															
	NET DATA	*CW		*AM	ISB																																																																																																		
AM EN	8	0	0	1	0	U25, U17, U7, U11, and associated circuits.																																																																																																	
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ISB EN	9	0	0	0	1																																																																																																		
(Cont)																																																																																																							

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																								
3. (Cont)	j. (Cont) Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc. Note Channel select tests, steps k through m, are applicable to receiver control only. k. Place MODE switch in the ISB position. l. Place CH B2 switch to ON position. m. Repeat step l for CH B1, CH A1, and CH A2 switches.	associated parallel output pin numbers. The display associated with the CH B2 ON position lights. Refer to chart for logic levels and associated parallel output pin numbers.																									
	<table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="2">CH SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>ON</th><th>OFF</th></tr><tr><td>A2 ENBL</td><td>17</td><td>1</td><td>0</td><td rowspan="4">} Check U25, U17, U7, U11, and associated circuits.</td></tr><tr><td>A1 ENBL</td><td>26</td><td>1</td><td>0</td></tr><tr><td>B1 ENBL</td><td>6</td><td>1</td><td>0</td></tr><tr><td>B2 ENBL</td><td>74</td><td>1</td><td>0</td></tr></table>	PARALLEL OUTPUT	PIN NO P1-()	CH SWITCH POSITION		IF ABNORMAL CHECK	ON	OFF	A2 ENBL	17	1	0	} Check U25, U17, U7, U11, and associated circuits.	A1 ENBL	26	1	0	B1 ENBL	6	1	0	B2 ENBL	74	1	0		
PARALLEL OUTPUT	PIN NO P1-()			CH SWITCH POSITION			IF ABNORMAL CHECK																				
		ON	OFF																								
A2 ENBL	17	1	0	} Check U25, U17, U7, U11, and associated circuits.																							
A1 ENBL	26	1	0																								
B1 ENBL	6	1	0																								
B2 ENBL	74	1	0																								
(Cont)	Note Channel select tests, steps n through p, are applicable to exciter control only. n. Place MODE switch in ISB position. o. Place channel A1 CHANNEL ENABLE switch in LINE position and then to MIC position. p. Repeat step o for channels A2, B1, and B2.	The display associated with channel A1 lights. Refer to chart for logic levels and associated parallel output pin numbers. Same as step o.																									

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE				NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	PARALLEL INPUT	PIN NO P1-()	CHANNEL ENABLE SWITCH POSITION			IF ABNORMAL CHECK
			LINE	OFF	MIC	
	A2 ENBL	17	1	0	1	U25, U17, U7, U11, and associated circuits.
	A1 ENBL	26	1	0	1	
	B1 ENBL	6	1	0	1	
	B2 ENBL	74	1	0	1	
(Cont)	Note Vbfo and AFC enable tests, steps q through t, are applicable to receiver controls only. q. Set control unit AFC switch to OFF. r. Set control unit AFC switch to ON. s. Set control unit VBFO switch to FXO. t. Set control unit VBFO switch to VAR. Note Peak clip enable test, step u and v, are applicable to exciter controls only.				Logic level 0 at P1-34. (NMT 0.5 V dc.) Logic level 1 at P1-34. (NLT +3.0 V dc.) Logic level 0 at P1-35. (NMT 0.5 V dc.) Logic level 1 at P1-35. (NLT 3.0 V dc.)	Check U26, U27, U17, U7, U11, and associated circuits. Same as step s.

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont.).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	u. Set control unit PEAK CLIP switch to OFF. v. Set control unit PEAK CLIP switch to ON.	Logic level 0 at P1-32. (NMT 0.5 V dc.) Logic level 1 at P1-32. (NLT 3.0 V dc.)	Same as step s.
4. Data inputs, word 3	a. Set control unit CONT switch to TEST. <i>Note</i> Word 3 tests can also be accomplished with control unit CONT switch in NORM and local unit CONT switch in REM. Then measure voltages at local unit parallel output card (the card being tested). Pa tests, steps b through e, are applicable to the exciter and receiver-exciter controls only. b. Set control unit PA PWR switch to OFF. c. Set control unit PA PWR switch to STBY. d. Set control unit PA PWR switch to HIGH PWR.	Check logic levels at the associated parallel output pin numbers as shown in chart. Check logic levels at the associated parallel output pin numbers as shown in chart. Check logic levels at the associated parallel output pin numbers as shown in chart.	
(Cont)			

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																														
4. (Cont)	e. Set control unit PA PWR switch to LOW PWR. Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc. <table><tr><th rowspan="2">PARALLEL OUTPUT</th><th rowspan="2">PIN NO P1-()</th><th colspan="4">PA PWR SWITCH POSITION</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>OFF</th><th>STBY</th><th>HIGH PWR</th><th>LOW PWR</th></tr><tr><td>PA LV EN</td><td>79</td><td>0</td><td>1</td><td>1</td><td>1</td><td rowspan="3">U19, U5, U7, U11, and associated circuits.</td></tr><tr><td>PA HV EN</td><td>14</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>LO PWR EN</td><td>78</td><td>0</td><td>0</td><td>0</td><td>1</td></tr></table>	PARALLEL OUTPUT	PIN NO P1-()	PA PWR SWITCH POSITION				IF ABNORMAL CHECK	OFF	STBY	HIGH PWR	LOW PWR	PA LV EN	79	0	1	1	1	U19, U5, U7, U11, and associated circuits.	PA HV EN	14	0	0	1	1	LO PWR EN	78	0	0	0	1	Check logic levels at the associated parallel output pin numbers as shown in chart.	
PARALLEL OUTPUT	PIN NO P1-()			PA PWR SWITCH POSITION					IF ABNORMAL CHECK																								
		OFF	STBY	HIGH PWR	LOW PWR																												
PA LV EN	79	0	1	1	1	U19, U5, U7, U11, and associated circuits.																											
PA HV EN	14	0	0	1	1																												
LO PWR EN	78	0	0	0	1																												
(Cont)	Note Pilot carrier tests, steps f and g, are applicable to the exciter controls only. f. Set control unit PILOT CARR switch to OFF. g. Set control unit PILOT CARR switch to ON. Note Dvbfo tests, steps h through k, are applicable only to the receiver with a dvbfo option installed. h. Set the control unit MODE switch to CW and the VBFO switch to VAR.	Logic level 0 at P1-82 (NMT 0.5 V dc). Logic level 1 at P1-82 (NLT +3.0 V dc).	Check U19, U5, U7, U11, and associated circuits.																														

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																																																										
4. (Cont)	i. Set digital VBFO controls for +9990 Hz. j. Set digital VBFO controls for -6660 Hz. k. Set digital VBFO controls for +1000 Hz. Note Logic 1 = NLT +3.0 V dc. Logic 0 = NMT 0.5 V dc.	VBFO frequency display reads +9990. Refer to chart for logic levels and associated parallel output pin numbers. VBFO frequency display reads -6660. Refer to chart for logic levels and associated parallel output pin numbers. VBFO frequency display reads +1000. Refer to chart for logic levels and associated parallel output pin numbers.	Measure logic levels as indicated in chart. Measure logic levels as indicated in chart. Measure logic levels as indicated in chart.																																																																										
<table><tr><th rowspan="2">BCD OUTPUT SIGNAL</th><th rowspan="2">PARALLEL OUTPUT PIN NO</th><th colspan="3">LOGIC LEVELS</th><th rowspan="2">IF ABNORMAL CHECK</th></tr><tr><th>+9990</th><th>-6660</th><th>+1000</th></tr><tr><td></td><td>P1-()</td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="4">DVBFO 1 kHz</td><td>(8) 48</td><td>1</td><td>0</td><td>0</td><td rowspan="4">U29, U5, U7, U11, and associated circuits.</td></tr><tr><td>(4) 113</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 47</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(1) 112</td><td>1</td><td>0</td><td>1</td></tr><tr><td rowspan="4">DVBFO 100 Hz</td><td>(8) 46</td><td>1</td><td>0</td><td>0</td><td rowspan="8">U21, U5, U7, U11, and associated circuits.</td></tr><tr><td>(4) 111</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 110</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(1) 44</td><td>1</td><td>0</td><td>0</td></tr><tr><td rowspan="4">DVBFO 10 Hz</td><td>(8) 109</td><td>1</td><td>0</td><td>0</td></tr><tr><td>(4) 43</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(2) 108</td><td>0</td><td>1</td><td>0</td></tr><tr><td>(1) 42</td><td>1</td><td>0</td><td>0</td></tr><tr><td>DVBFO SIGN</td><td>107</td><td>1</td><td>0</td><td>1</td><td>U29, U5, U7, U11, and associated circuits.</td></tr></table>				BCD OUTPUT SIGNAL	PARALLEL OUTPUT PIN NO	LOGIC LEVELS			IF ABNORMAL CHECK	+9990	-6660	+1000		P1-()					DVBFO 1 kHz	(8) 48	1	0	0	U29, U5, U7, U11, and associated circuits.	(4) 113	0	1	0	(2) 47	0	1	0	(1) 112	1	0	1	DVBFO 100 Hz	(8) 46	1	0	0	U21, U5, U7, U11, and associated circuits.	(4) 111	0	1	0	(2) 110	0	1	0	(1) 44	1	0	0	DVBFO 10 Hz	(8) 109	1	0	0	(4) 43	0	1	0	(2) 108	0	1	0	(1) 42	1	0	0	DVBFO SIGN	107	1	0	1	U29, U5, U7, U11, and associated circuits.
BCD OUTPUT SIGNAL	PARALLEL OUTPUT PIN NO	LOGIC LEVELS				IF ABNORMAL CHECK																																																																							
		+9990	-6660	+1000																																																																									
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DVBFO 1 kHz	(8) 48	1	0	0	U29, U5, U7, U11, and associated circuits.																																																																								
	(4) 113	0	1	0																																																																									
	(2) 47	0	1	0																																																																									
	(1) 112	1	0	1																																																																									
DVBFO 100 Hz	(8) 46	1	0	0	U21, U5, U7, U11, and associated circuits.																																																																								
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	(2) 108	0	1	0																																																																									
	(1) 42	1	0	0																																																																									
DVBFO SIGN	107	1	0	1	U29, U5, U7, U11, and associated circuits.																																																																								

(Cont)

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	a. Set control unit CONT switch to NORM. b. Set local unit CONT switch to LCL. Note System key test, steps c and d, is applicable only to exciter controls. c. Set local unit KEY switch to LOCK. d. Set local unit KEY switch to NORM. e. Set local unit PWR switch off. f. Set local unit PWR switch to ON. Change any frequency control on local unit front panel. Note Receive overload test, steps g and h, is applicable only to receiver controls. g. Connect +5 V dc to local unit J16-27. h. Remove +5 V dc from local unit J16-27. Note Coupler fault test, steps i and j, is applicable only to exciter controls.	Control unit KEY display lights. Logic level 1 at P1-68 (NLT +3.0 V dc). Control unit KEY display goes out. Logic level 0 at P1-68 (NMT 0.5 V dc). Control unit EXCTR FAULT flashes. Logic level 1 follows light at P1-12 (NLT +3.0 V dc). Control unit EXCTR FAULT goes out. Logic level 0 at P1-12 (NMT 0.5 V dc). Control unit RF OVERLOAD lights. Logic level 1 at P1-68 (NLT +3.0 V dc). Control unit RF OVERLOAD goes out. Logic level 0 at P1-68 (NMT 0.5 V dc).	Check U15, U17, U7, U11, and associated circuits. Check U16, U12, U32, U8, U17, U7, U11, and associated circuits. Check U16, U17, U7, U11, and associated circuits. Same as step g.
(Cont)			

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	i. Connect +5 V dc to local unit J15-1. j. Remove +5 V dc from local unit J15-1. Note Rf out test, steps k and l, is applicable only to exciter controls. k. Connect ground signal to local unit J15-5. l. Remove ground signal from local unit J15-5. Note Pa fault test, steps m and n, is applicable only to exciter controls. m. Connect +5 V dc to local unit J15-3. n. Remove +5 V dc from local unit J15-3. Note Pa ready test, steps o and p, is applicable only to exciter controls. o. Connect ground signal to local unit J15-21.	Control unit COUPLER FAULT lights. Logic level 1 at P1-92 (NLT +3.0 V dc). Control unit COUPLER FAULT lights. Logic level 0 at P1-92 (NMT 0.5 V dc). Control unit RF OUT lights. Logic level 1 at P1-5 (NLT +3.0 V dc). Control unit RF OUT goes out. Logic level 0 at P1-5 (NMT 0.5 V dc). Control unit PA FAULT lights. Logic level 1 at P1-104 (NLT +3.0 V dc). Control unit PA FAULT goes out. Logic level 0 at P1-104 (NMT 0.5 V dc). Control unit PA READY lights. Logic level 0 at P1-70 (NMT 0.5 V dc).	Same as step g.
(Cont)			

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	p. Remove ground signal from local unit J15-21. q. Press and hold local unit CONT switch to MON. r. Set local unit CONT switch to REM. s. Set local unit CONT switch to LCL. t. Set local unit CONT switch to REM. u. Set local unit CONT switch to LCL. v. Apply a ground to local unit A13U51A-6. w. Apply a ground to local unit A13U51A-3. x. Remove ground from local unit A13U51A-3. y. Apply ground to local unit A13U16A-1, 2, 8. z. Remove ground from local unit A13U16A-1, 2, 8. aa. Remove ground from local unit A13U51A-6. ab. Apply ground to local unit A13U42A-3.	Control unit PA READY goes out. Logic level 0 at P1-70 (NMT 0.5 V dc). Logic level 1 at P1-30 (NLT +3.0 V dc). Logic level 0 at P1-30 (NMT 0.5 V dc). Logic level 1 at P1-95 (NLT +3.0 V dc). Control unit BUSY indicator lights. Logic level 1 at P1-7 (NLT +3.0 V dc). After short delay logic level 0 at P1-95 (NMT 0.5 V dc). After short delay control unit BUSY indicator goes out. Logic level 0 at P1-7 (NMT 0.5 V dc). Logic level 1 at P1-29 (NLT +3.0 V dc). Logic level 0 at P1-29 (NMT 0.5 V dc).	Same as step g. Check U24, U17, U7, U11, and associated circuits. Check U28, U20, U12, U4, U24, U17, U7, U11, and associated circuits. Same as step s. Same as step q.
(Cont)			

Table 2. Parallel Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	ac. Remove ground from local unit A13U42A-3. ad. Apply +5 V dc to local unit J16-8. ae. Remove +5 V dc from local unit J16-8.	Control unit PRE-SEL FAULT lights. Logic level 1 at P1-28 (NLT +3.0 V dc). Control unit PRE-SEL FAULT goes out. Logic level 0 at P1-28 (NMT 0.5 V dc).	Same as step q.

4. UNIT STRAPPING

The parallel output card must be strapped for proper operation at initial installation and/or following testing and troubleshooting. Strapping is accomplished using jumper clips over the square pins marked E1 through E6.

Place jumper connectors (quantity 4) on each of the square pin pairs labeled E1 through E4.

Pin pair E5 is strapped between the middle and top pins for a flashing fault indicator or strapped between the middle and bottom pins for a nonflashing fault indicator.

Pin pair E6 is strapped between the middle and right pins for character 4, bit 1 fault position (2-channel equipment) or character 2, bit 6 fault position (4-channel equipment).

5. REPAIR

Repair of the parallel output card is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

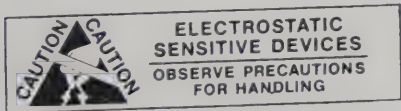
6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic

diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 3). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

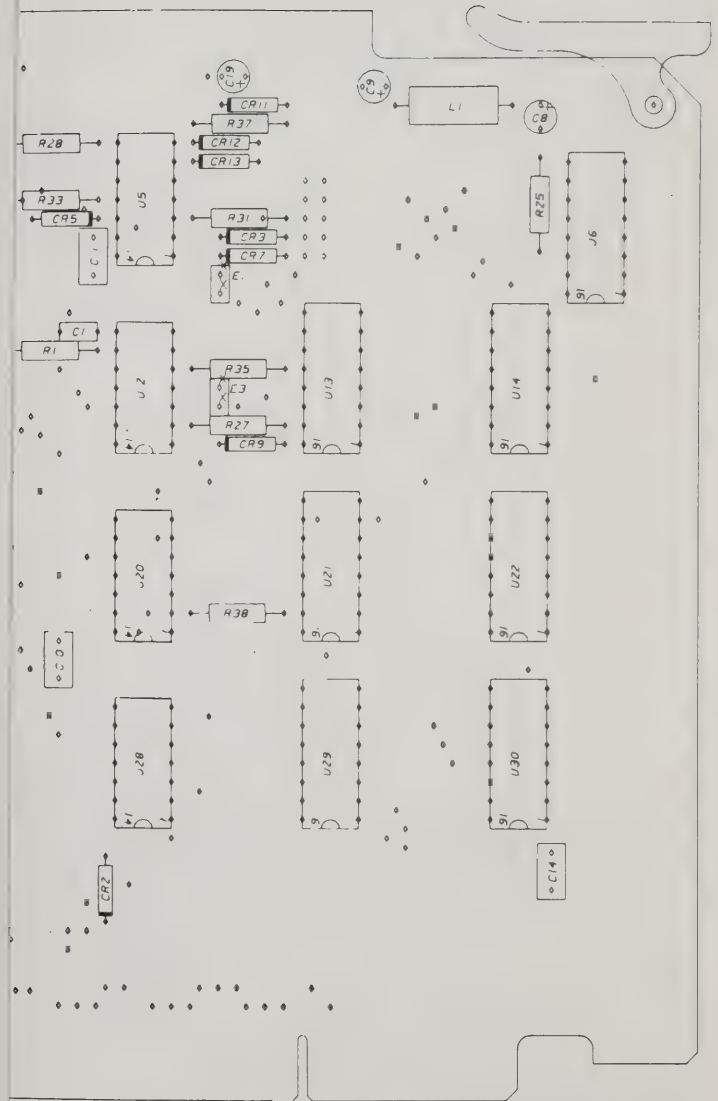
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04099	CAPCO INC FORESIGHT INDUSTRIAL PARK P O BOX 2164 GRAND JUNCTION CO 81501
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
22526	BERG ELECTRONICS INC YOUK EXPRESSWAY NEW CUMBERLAND PA 17070
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
80294	BOURNS INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
96906	MILITARY STANDARD

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

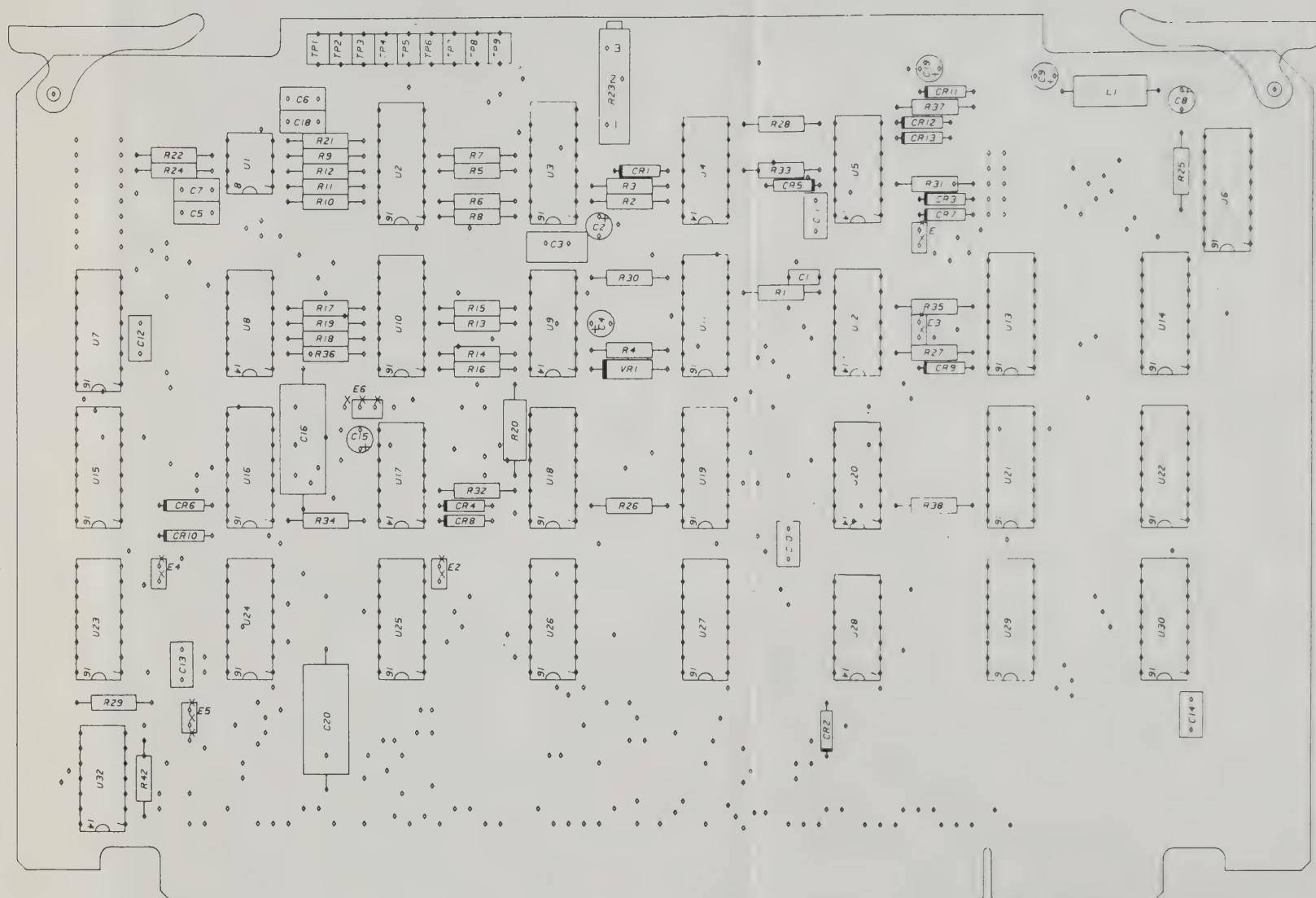
<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Parallel Output	642-3137-001	REV F



TPA-2686-019



Parallel Output, Schematic Diagram
Figure 3 (Sheet 1 of 6)



TPA-2686-019



ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

Parallel Output, Schematic Diagram
Figure 3 (Sheet 1 of 6)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR COO
	PARALLEL OUTPUT (ESDS)	642-3137-001		
CR1-CR13	SEMICONO DEVICE	353-3644-010		0351
C1	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134
C2	CAPACITOR,FXD TMTLM ELCTLT, 0.47UF, 20%, 35V	184-9102-330		5621
C3	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 500V	912-3879-000		8134
C4	CAPACITOR,FXD TMTLM ELCTLT, 15UF, 20%, 15V	184-9102-130		5621
C5-C7	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654
C8	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		5621
C9	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		5621
C10-C14	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654
C15	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		5621
C16	CAPACITOR,FXD PLSTC DIEL, 1UF, 10%, 50V	933-1081-200		0401
C17	NOT USED			
C18	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654
C19	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		5621
C20	CAPACITOR,FXD PLSTC DIEL, 1UF, 10%, 50V	933-1081-200		0401
E1-E6	CORNECTOR,JHPR SYS	372-0046-010		2251
L1	COIL,RF 1000M	240-2540-000		9691
R1	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R2,R3	RESISTOR,FXD CMPSN, 1.8MEGO, 10%, 1/4W	745-0866-000		8134
R4	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/4W	745-0755-000		8134
R5	RESISTOR,FXD FILM, 10.2K, 1%, 1/8W	705-3605-480		8134
R6	RESISTOR,FXD FILM, 11K, 1%, 1/8W	705-1046-000		8134
R7	RESISTOR,FXD FILM, 11.8K, 1%, 1/8W	705-3605-510		8134
R8	RESISTOR,FXD FILM, 13K, 1%, 1/8W	705-3605-530		8134
R9	RESISTOR,FXD FILM, 14K, 1%, 1/8W	705-1051-000		8134
R10	RESISTOR,FXD FILM, 15.4K, 1%, 1/8W	705-1053-000		8134
R11	RESISTOR,FXD FILM, 17.4K, 1%, 1/8W	705-3605-590		8134
R12	RESISTOR,FXD FILM, 19.6K, 1%, 1/8W	705-1058-000		8134
R13	RESISTOR,FXD FILM, 22.1K, 1%, 1/8W	705-3605-640		8134
R14	RESISTOR,FXD FILM, 26.1K, 1%, 1/8W	705-1064-000		8134
R15	RESISTOR,FXD FILM, 30.9K, 1%, 1/8W	705-3605-710		8134
R16	RESISTOR,FXD FILM, 38.3K, 1%, 1/8W	705-1072-000		8134
R17	RESISTOR,FXD FILM, 51.1K, 1%, 1/8W	705-1078-000		8134
R18	RESISTOR,FXD FILM, 76.8K, 1%, 1/8W	705-3605-900		8134
R19	RESISTOR,FXD FILM, 154K, 1%, 1/8W	705-1101-000		8134
R20	RESISTOR,FXD FILM, 309K, 1%, 1/4W	705-3601-230		8134
R21,R22	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		8134
R23	RESISTOR,VAR 10K, 10%, 3/4W	382-0012-290		8029
R24	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-000		8134
R25,R26	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R27	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		8134
R28-R35	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R36	RESISTOR,FXD CMPSN, 0.68MEGO, 10%, 1/4W	745-0851-000		8134
R37,R38	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R39-R41	NOT USED			
R42	RESISTOR,FXD CMPSN, 2.7MEGO, 10%, 1/4W	745-0872-000		8134
TP1	JACK,TIP BRN	360-0484-070		7497
TP2	JACK,TIP RED	360-0484-020		7497
TP3	JACK,TIP ORN	360-0484-050		7497
TP4	JACK,TIP YEL	360-0484-060		7497
TP5	JACK,TIP GRN	360-0484-040		7497
TP6	JACK,TIP BLU	360-0484-080		7497
TP7	JACK,TIP VIO	360-0484-090		7497
TP8	JACK,TIP GRA	360-0484-100		7497
TP9	JACK,TIP WHT	360-0484-010		7497
U1	INTEGRATED CIRCUIT OPNL AMPLIFIER	351-1071-070		0726
U2	INTEGRATED CKT (ESDS)	351-8227-010		0726
U3	INTEGRATED CIRCUIT (ESDS)	351-8479-010		0471
U4	INTEGRATED CIRCUIT (ESDS)	351-8159-040		0471
U5	INTEGRATED CIRCUIT (ESDS)	351-8159-110		0726
U6	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		0273
U7	INTEGRATED CKT (ESDS)	351-8227-010		0726
U8	MICROCIRCUIT (ESDS)	351-8200-020		0273
U9	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-010		0273
U10	INTEGRATED CKT (ESDS)	351-8227-010		0726
U11	INTEGRATED CIRCUIT (ESDS)	351-8159-210		0726
U12	INTEGRATED CIRCUIT (ESDS)	351-8407-010		0471
U13-U16	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		0273
U17	INTEGRATED CIRCUIT (ESDS)	351-8159-110		0726
U18,U19	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		0273
U20	INTEGRATED CIRCUIT (ESDS)	351-8159-110		0726
U21-U27	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		0273
U28	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-030		0273
U29,U30	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		0273
U31	NOT USED			
U32	MICROCIRCUIT (ESDS)	351-8200-020		0273
VR1	SEMICONO DEVICE	353-2710-000		0726

PARTS LIST

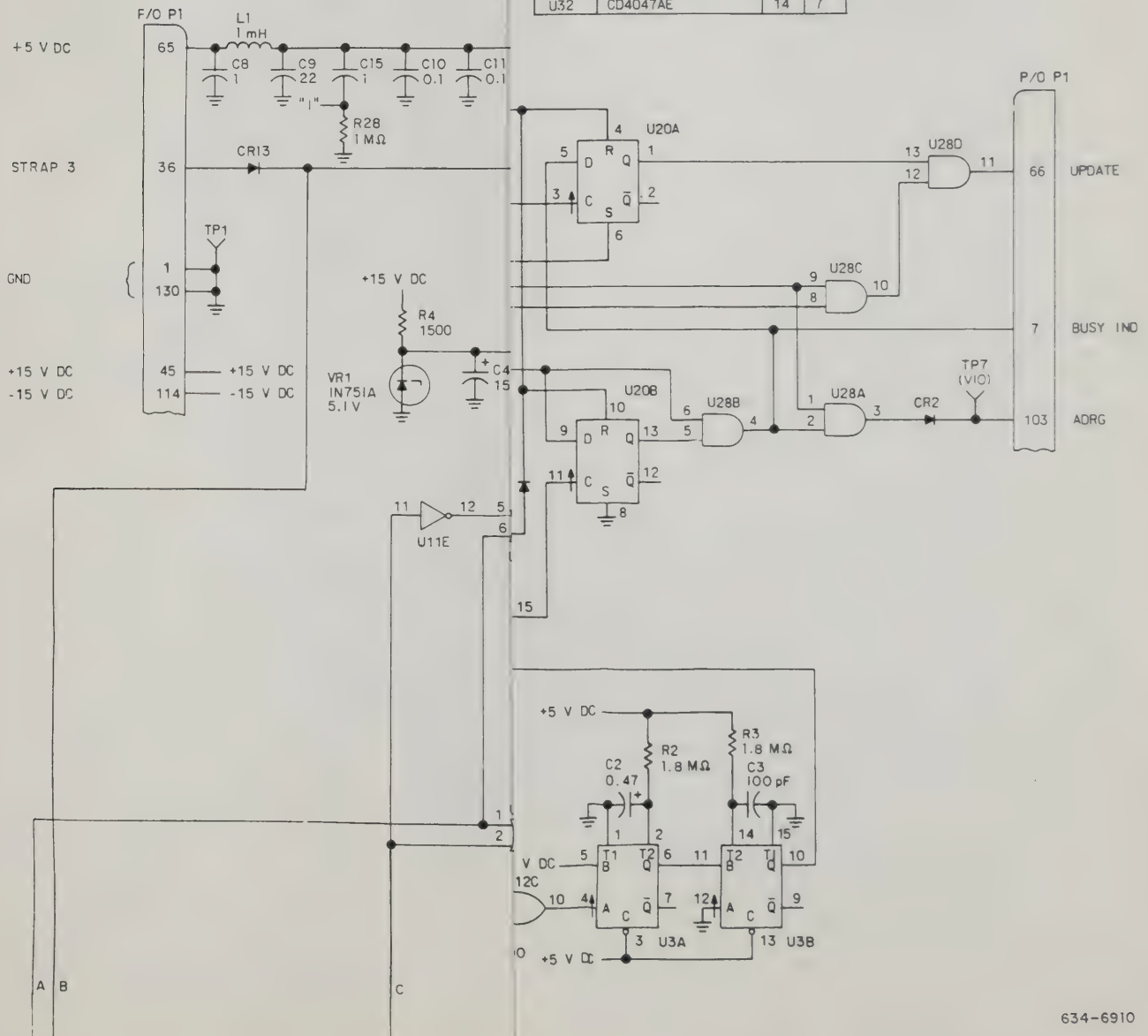
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	PARALLEL OUTPUT (ESDS)	642-3137-001			
CR1-CR13	SEMICOND DEVICE	353-3644-010		03508	1N4454GE
C1	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK058X102K
C2	CAPACITOR,FXD TMTLM ELCTLT, 0.47UF, 20%, 35V	184-9102-330		56289	199D474X0035AB1
C3	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 500V	912-3879-000		81349	CM04FD101J03
C4	CAPACITOR,FXD TMTLM ELCTLT, 15UF, 20%, 15V	184-9102-130		56289	199D156X0015CB1
C5-C7	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C8	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C9	CAPACITOR,FXD TMTLM ELCTLT, 22UF, 20%, 10V	184-9102-080		56289	199D226X0010CB1
C10-C14	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C15	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C16	CAPACITOR,FXD PLSTC DIEL, 1UF, 10%, 50V	933-1081-200		04099	CRCL-200
C17	NOT USED				
C18	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C19	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C20	CAPACITOR,FXD PLSTC DIEL, 1UF, 10%, 50V	933-1081-200		04099	CRCL-200
E1-E6	CONNECTOR,JMPR SYS	372-0046-010		22526	65474-001
L1	COIL,RF 1000UH	240-2540-000		96906	MS90539-15
R1	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R2,R3	RESISTOR,FXD CHPSN, 1.8MEGO, 10%, 1/4W	745-0866-000		81349	RCR07G185KS
R4	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS
R5	RESISTOR,FXD FILM, 10.2K, 1%, 1/8W	705-3605-480		81349	RN5501102F
R6	RESISTOR,FXD FILM, 11K, 1%, 1/8W	705-1046-000		81349	RN5501102F
R7	RESISTOR,FXD FILM, 11.8K, 1%, 1/8W	705-3605-510		81349	RN5501182F
R8	RESISTOR,FXD FILM, 13K, 1%, 1/8W	705-3605-530		81349	RN55011302F
R9	RESISTOR,FXD FILM, 14K, 1%, 1/8W	705-1051-000		81349	RN5501402F
R10	RESISTOR,FXD FILM, 15.4K, 1%, 1/8W	705-1053-000		81349	RN5501542F
R11	RESISTOR,FXD FILM, 17.4K, 1%, 1/8W	705-3605-590		81349	RN5501742F
R12	RESISTOR,FXD FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F
R13	RESISTOR,FXD FILM, 22.1K, 1%, 1/8W	705-3605-640		81349	RN5502212F
R14	RESISTOR,FXD FILM, 26.1K, 1%, 1/8W	705-1064-000		81349	RN5502612F
R15	RESISTOR,FXD FILM, 30.9K, 1%, 1/8W	705-3605-710		81349	RN5503092F
R16	RESISTOR,FXD FILM, 36.3K, 1%, 1/8W	705-1072-000		81349	RN5503832F
R17	RESISTOR,FXD FILM, 51.1K, 1%, 1/8W	705-1078-000		81349	RN5505112F
R18	RESISTOR,FXD FILM, 76.8K, 1%, 1/8W	705-3605-900		81349	RN5507682F
R19	RESISTOR,FXD FILM, 154K, 1%, 1/8W	705-1101-000		81349	RN5501543F
R20	RESISTOR,FXD FILM, 309K, 1%, 1/4W	705-3601-230		81349	RN6003093F
R21,R22	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN5501002F
R23	RESISTOR,VAR 10K, 10%, 3/4W	382-0012-290		80294	3006PI-103
R24	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN5501001F
R25,R26	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R27	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R28-R35	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R36	RESISTOR,FXD CHPSN, 0.68MEGO, 10%, 1/4W	745-0851-000		81349	RCR07G684KS
R37,R38	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R39-R41	NOT USED				
R42	RESISTOR,FXD CHPSN, 2.7MEGO, 10%, 1/4W	745-0872-000		81349	RCR07G275KS
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
TP3	JACK,TIP ORN	360-0484-050		74970	105-1106-011
TP4	JACK,TIP YEL	360-0484-060		74970	105-1107-011
TP5	JACK,TIP GRN	360-0484-040		74970	105-1104-011
TP6	JACK,TIP BLU	360-0484-080		74970	105-1110-011
TP7	JACK,TIP VIO	360-0484-090		74970	105-1112-011
TP8	JACK,TIP GRA	360-0484-100		74970	105-1113-011
TP9	JACK,TIP MHT	360-0484-010		74970	105-1101-011
U1	INTEGRATED CIRCUIT OPNL AMPLIFIER	351-1071-070		07263	UA1458TC
U2	INTEGRATED CKT (ESDS)	351-8227-010		07263	F4051PC
U3	INTEGRATED CIRCUIT (ESDS)	351-8479-010		04713	MC14538BCP
U4	INTEGRATED CIRCUIT (ESDS)	351-8159-040		04713	MC14011UBCP
U5	INTEGRATED CIRCUIT (ESDS)	351-8159-110		07263	4013BPC
U6	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		02735	CD4094BE
U7	INTEGRATED CKT (ESDS)	351-8227-010		07263	F4051PC
U8	MICROCIRCUIT (ESDS)	351-8200-020		02735	CD4047BE
U9	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-010		02735	CD4071BE
U10	INTEGRATED CKT (ESDS)	351-8227-010		07263	F4051PC
U11	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049BPC
U12	INTEGRATED CIRCUIT (ESDS)	351-8407-010		04713	MC14070BCP
U13-U16	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		02735	CD4094BE
U17	INTEGRATED CIRCUIT (ESDS)	351-8159-110		07263	4013BPC
U18,U19	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		02735	CD4094BE
U20	INTEGRATED CIRCUIT (ESDS)	351-8159-110		07263	4013BPC
U21-U27	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		02735	CD4094BE
U28	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-030		02735	CD4081BE
U29,U30	INTEGRATED CIRCUIT REGISTER (ESDS)	351-8346-010		02735	CD4094BE
U31	NOT USED				
U32	MICROCIRCUIT (ESDS)	351-8200-020		02735	CD4047BE
VP1	SEMICOND DEVICE	353-2710-000		07263	1N751A

NOTES:

- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS.
- ② PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETION WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ③ TYPE DESIGNATION SHOWN MAY BE GENERIC IN FORM AND ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT.
- ④ UNLESS OTHERWISE SPECIFIED, DIODES ARE TYPE IN4454.
- ⑤ P2 IS A CABLE CONNECTOR FIELD. THIS CABLE CONNECTOR IS NOT IN 642-3137-001 CONFIGURATION.
- ⑥ THE FOLLOWING PARTS PROVIDE FOR REMOTE CONTROL OF RADIO AND ARE NOT IN 642-3137-001 CONFIGURATION: U31 AND U32.

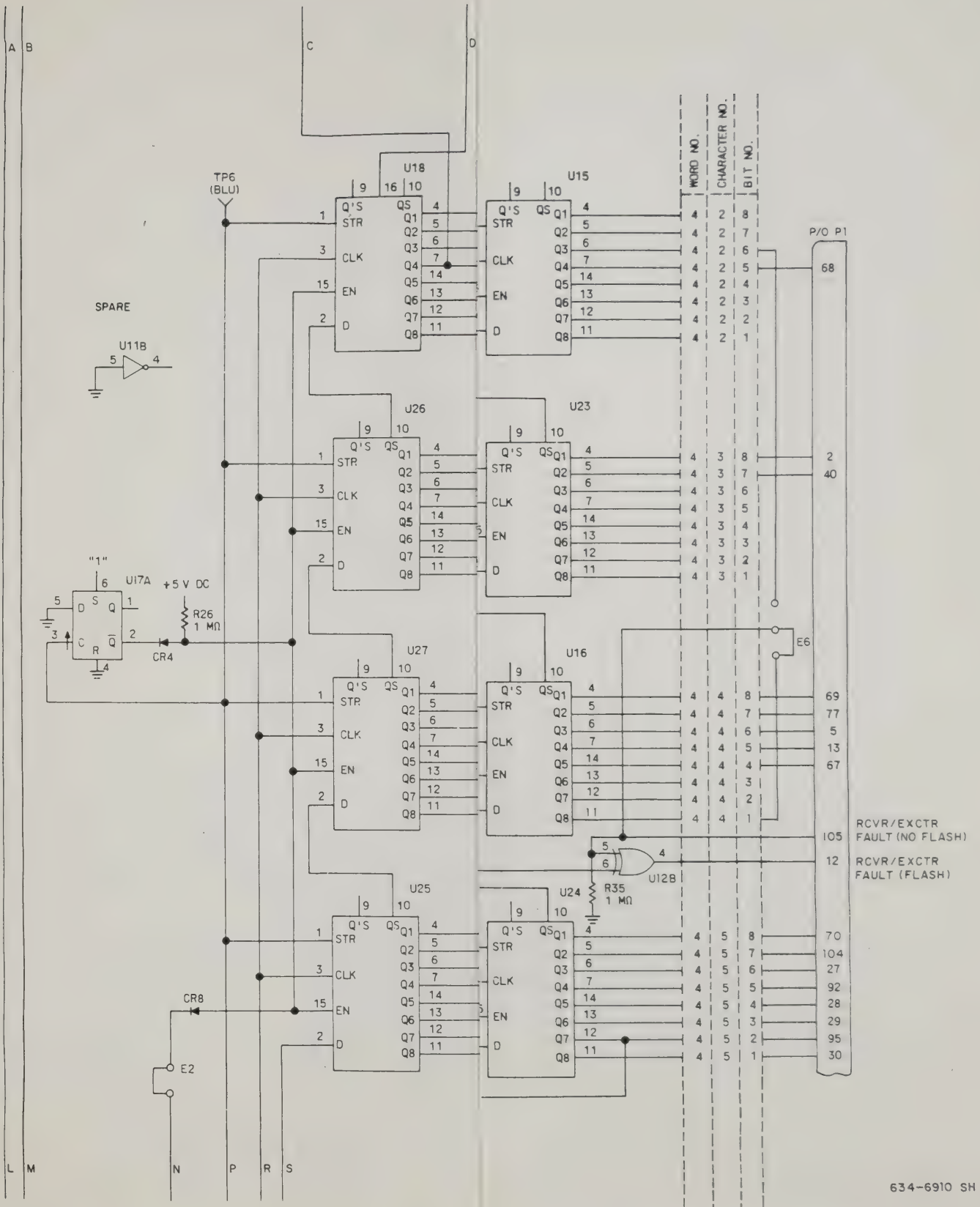
MICROCIRCUIT INFORMATION

REF DES	COMMON DEVICE OR COLLINS PN	PWR (V DC)	
		*5	GND
U17	F4013BPC	14	7
U18	CD4094BE	16	8
U19	CD4094BE	16	8
U20	F4013BPC	14	7
U21	CD4094BE	16	8
U22	CD4094BE	16	8
U23	CD4094BE	16	8
U24	CD4094BE	16	8
U25	CD4094BE	16	8
U26	CD4094BE	16	8
U27	CD4094BE	16	3
U28	MC14081BCP	14	7
U29	CD4094BE	16	8
U30	CD4094BE	16	8
U31	CD4094BE	16	8
U32	CD4047AE	14	7

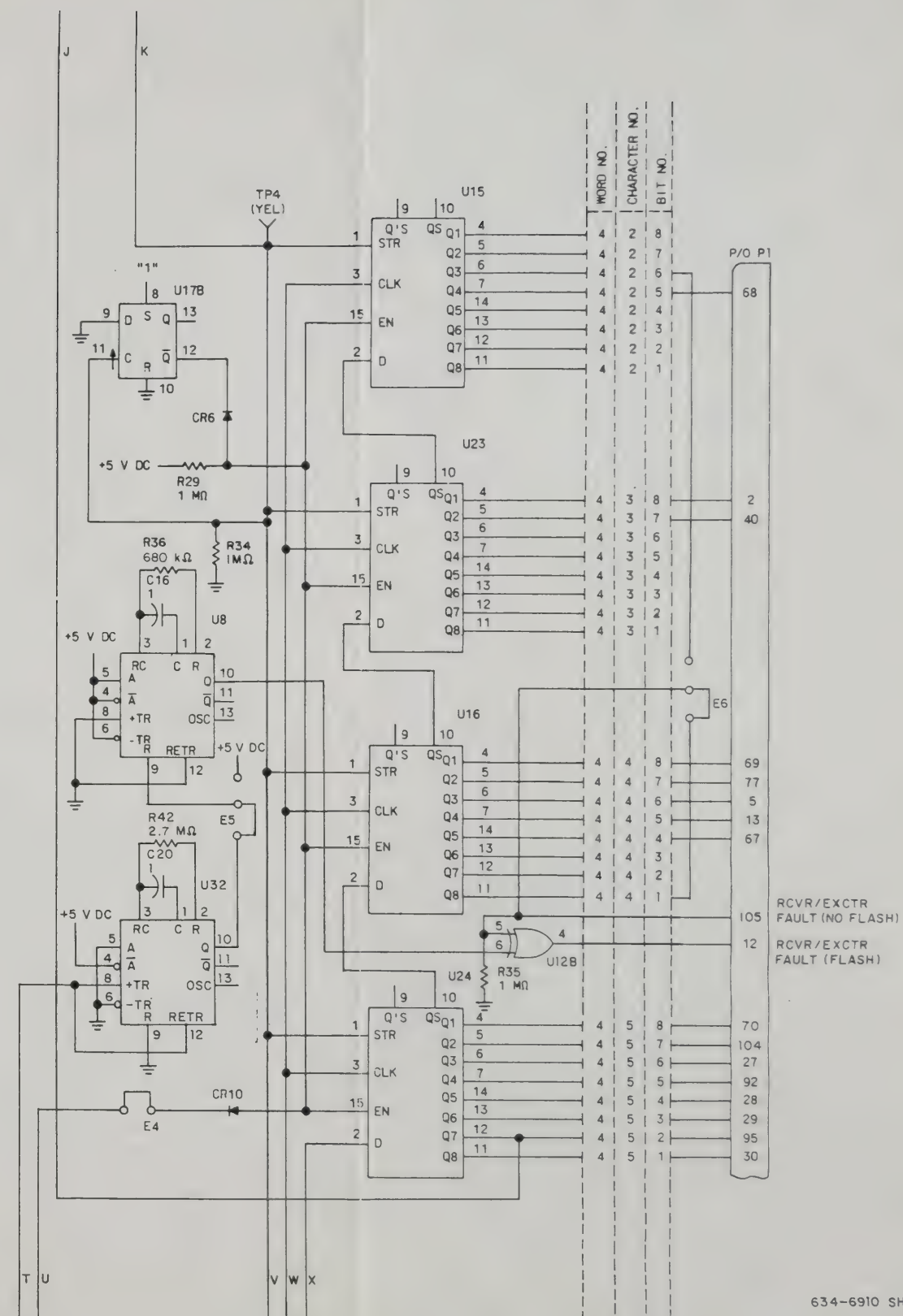
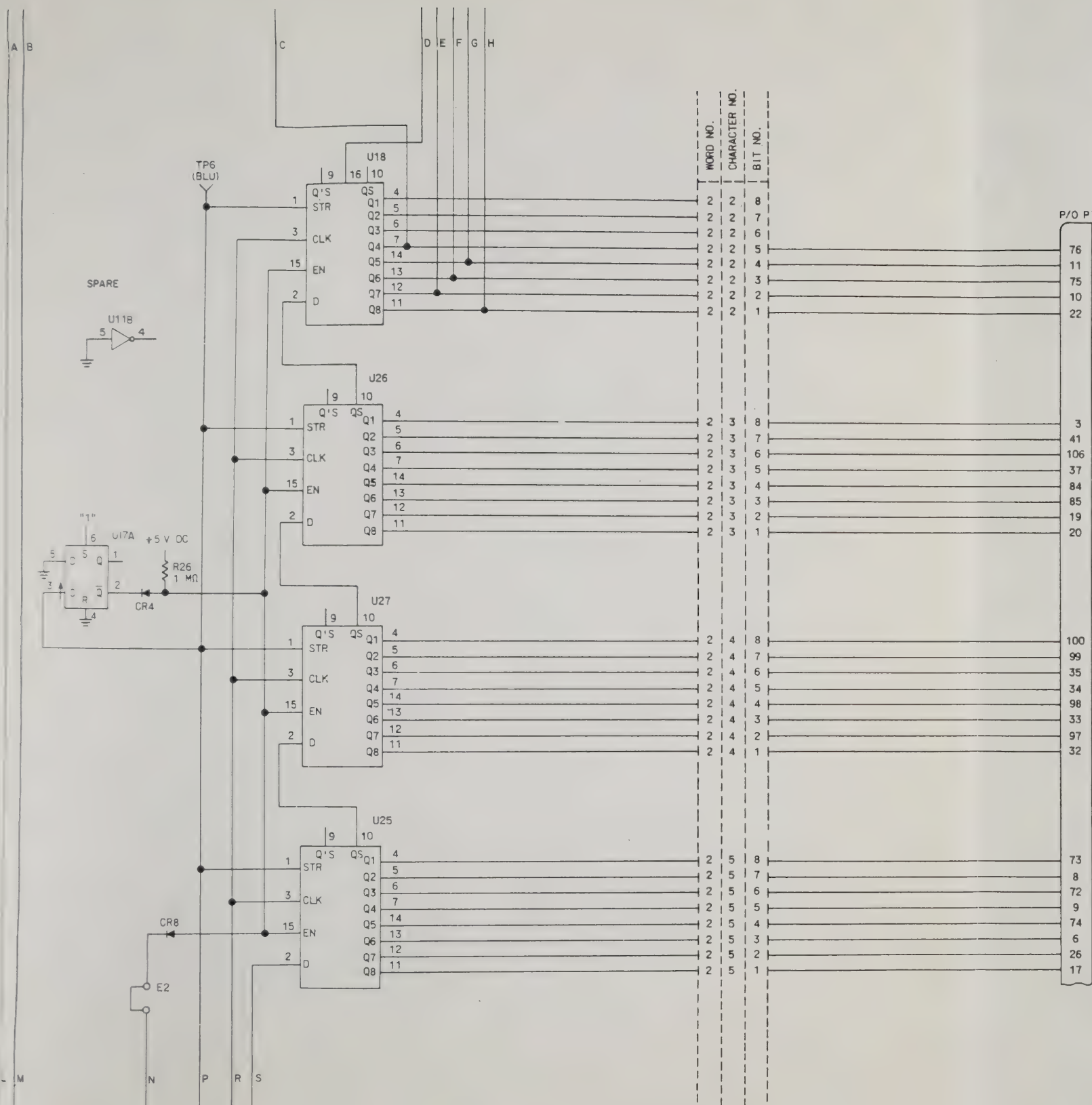


634-6910

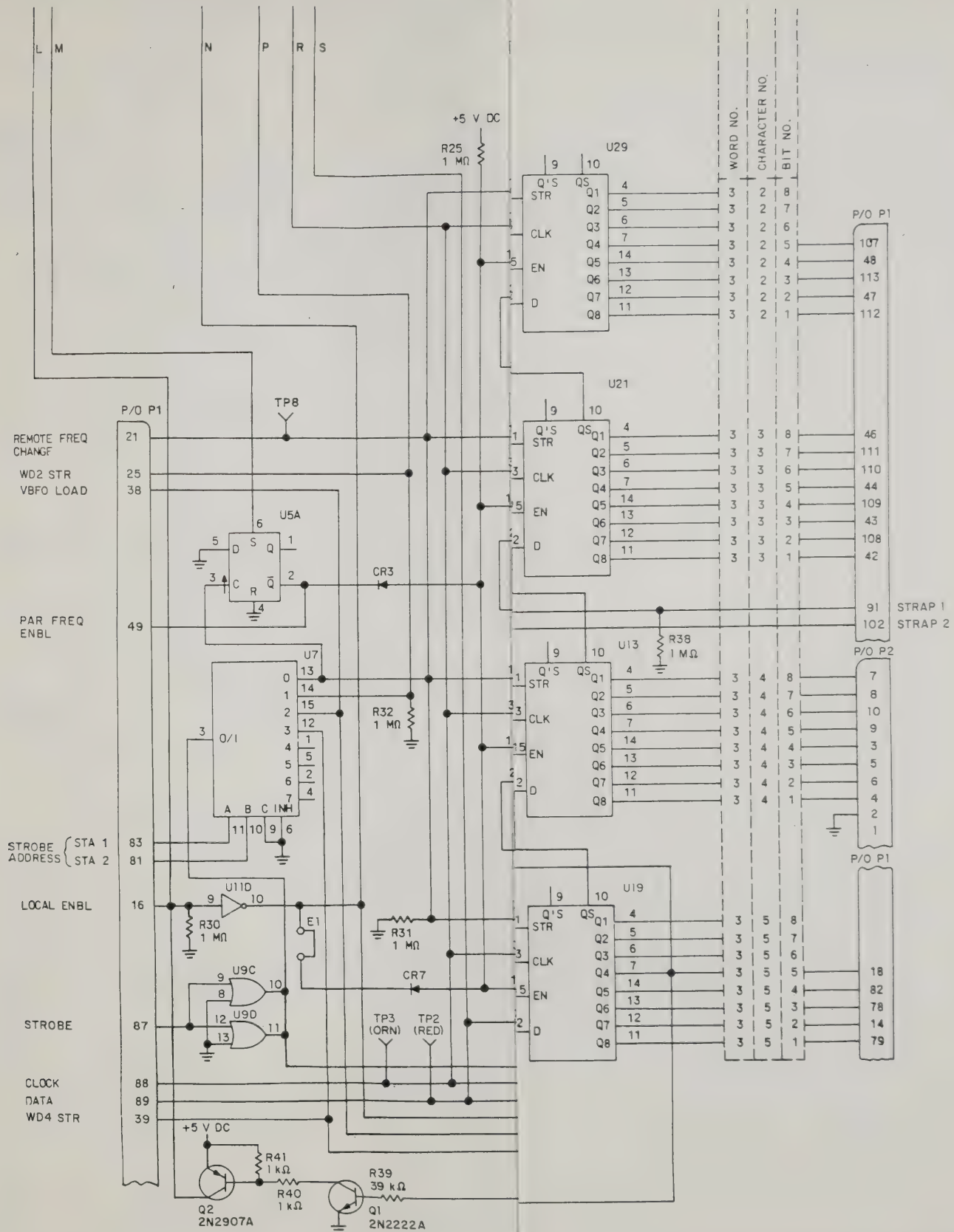
Parallel Output, Schematic Diagram
Figure 3 (Sheet 3)



Parallel Output, Schematic Diagram
Figure 3 (Sheet 4)

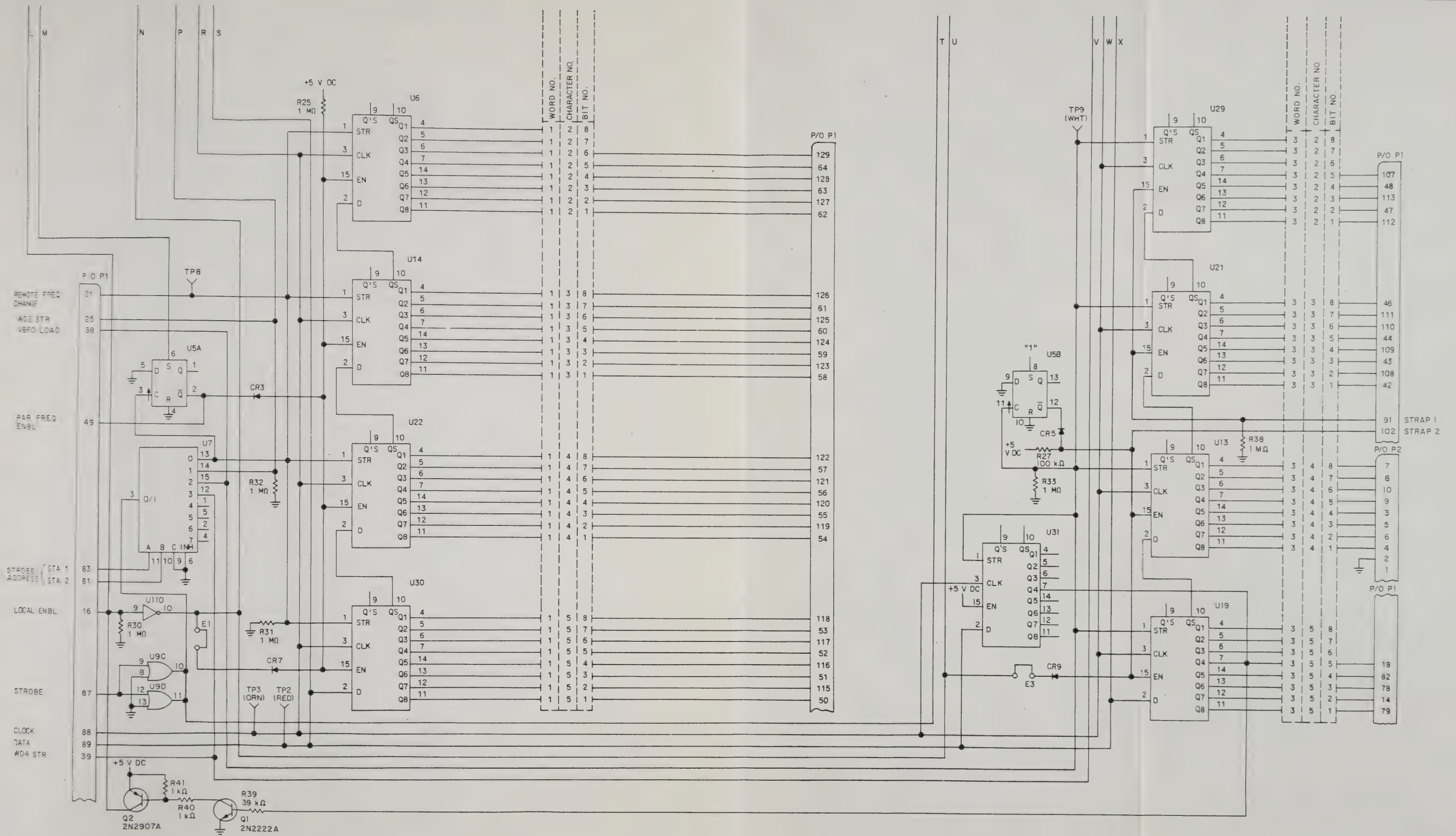


Parallel Output, Schematic Diagram
Figure 3 (Sheet 4)



634-6910 SH 3

Parallel Output, Schematic Diagram
Figure 3 (Sheet 5)



634-6910 SH 3
Parallel Output, Schematic Diagram
Figure 3 (Sheet 5)

EQUIPMENT TYPE

SIS-1/2, HF-8095

4 - CHANNEL EXCITER, AND 4 - CHANNEL EXCITER CONTROL			4 - CHANNEL RECEIVER, AND 4 - CHANNEL RECEIVER CONTROL		
FUNCTION	PARALLEL OUTPUT PIN NO.	PARALLEL INPUT PIN NO.	FUNCTION	PARALLEL OUTPUT PIN NO.	PARALLEL INPUT PIN NO.
COMMAND (C)			NOT USED		
STATUS REQUEST (S)			NOT USED		
FREQ 10 MHz (2)	129	129	FREQ 10 MHz (2)	129	129
FREQ 10 MHz (1)	64	64	FREQ 10 MHz (1)	64	64
FREQ 1 MHz (8)	128	128	FREQ 1 MHz (8)	128	128
↓ (4)	63	63	↓ (4)	113	113
↓ (2)	127	127	↓ (2)	47	47
↓ (1)	62	62	↓ (1)	112	112
FREQ 100 kHz (8)	126	126	FREQ 100 kHz (8)	126	126
↓ (4)	61	61	↓ (4)	111	111
↓ (2)	125	125	↓ (2)	110	110
↓ (1)	60	60	↓ (1)	44	44
FREQ 10 kHz (8)	124	124	FREQ 10 kHz (8)	124	124
↓ (4)	59	59	↓ (4)	109	109
↓ (2)	123	123	↓ (2)	43	43
↓ (1)	58	58	↓ (1)	108	108
FREQ 1 kHz (8)	122	122	FREQ 1 kHz (8)	122	122
↓ (4)	57	57	↓ (4)	7	7
↓ (2)	121	121	↓ (2)	8	8
↓ (1)	56	56	↓ (1)	10	10
FREQ 100 Hz (8)	120	120	FREQ 100 Hz (8)	120	120
↓ (4)	55	55	↓ (4)	9	9
↓ (2)	119	119	↓ (2)	3	3
↓ (1)	54	54	↓ (1)	5	5
FREQ 10 Hz (8)	118	118	FREQ 10 Hz (8)	118	118
↓ (4)	53	53	↓ (4)	6	6
↓ (2)	117	117	↓ (2)	4	4
↓ (1)	52	52	↓ (1)		
FREQ 1 Hz (8)	116	116	FREQ 1 Hz (8)	116	116
↓ (4)	51	51	↓ (4)	18	18
↓ (2)	115	115	↓ (2)	82	82
↓ (1)	50	50	↓ (1)	78	78
COMMAND (C)			NOT USED		
STATUS REQUEST (S)			NOT USED		
NOT USED			NOT USED		
RF GAIN (16)	76	76	RF GAIN (16)	76	76
↓ (8)	11	11	↓ (8)	13	13
↓ (4)	75	75	↓ (4)	68	68
↓ (2)	10	10	↓ (2)	88	88
↓ (1)	22	87	↓ (1)	23	23
NOT USED			NOT USED		
VBFO ENBL	3	12	VBFO ENBL	3	12
RESERVED	41	41	RESERVED	41	41
AGC CROWBAR ENBL	106	106	AGC CROWBAR ENBL	106	106
USB AGC OFF	37	37	USB AGC OFF	37	37
USB AGC FAST	84	84	USB AGC FAST	84	84
LSB AGC OFF	85	85	LSB AGC OFF	85	85
LSB AGC FAST	19	19	LSB AGC FAST	19	19
FL8 ENBL	20	20	FL8 ENBL	20	20
FL7 ENBL	100	100	FL7 ENBL	100	100
FL6 ENBL	99	99	FL6 ENBL	99	99
FL5 ENBL	35	35	FL5 ENBL	35	35
FL4 ENBL	34	34	FL4 ENBL	34	34
FL3 ENBL	98	98	FL3 ENBL	98	98
FL2 ENBL	33	33	FL2 ENBL	33	33
FL1 ENBL	97	97	FL1 ENBL	97	97
FM ENBL	32	32	FM ENBL	32	32
AM ENBL	73	73	AM ENBL	73	73
SSB ENBL	8	8	SSB ENBL	8	8
CW ENBL	72	72	CW ENBL	72	72
ISB ENBL	9	9	ISB ENBL	9	9
RESERVED	74	74	RESERVED	74	74
RESERVED	6	92	RESERVED	6	92
RESERVED	26	91	RESERVED	26	91
RESERVED	17	21	RESERVED	17	21

634-6910

Parallel Output, Schematic Diagram
Figure 3 (Sheet 6)

634-6910

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CONTROL / STATUS BIT

WORD FORMAT					
HF-80 8-BIT			ASCII 7-BIT		
WORD NO.	CHARACTER NO.	BIT NO.	WORD NO.	CHARACTER NO.	BIT WT.
1	2	8	1	6	8
1	2	7	1	6	4
1	2	6	1	6	2
1	2	5	1	6	1
1	2	4	1	7	8
1	2	3	1	7	4
1	2	2	1	7	2
1	2	1	1	7	1
1	3	8	1	8	8
1	3	7	1	8	4
1	3	6	1	8	2
1	3	5	1	8	1
1	3	4	1	9	8
1	3	3	1	9	4
1	3	2	1	9	2
1	3	1	1	9	1
1	4	8	1	10	8
1	4	7	1	10	4
1	4	6	1	10	2
1	4	5	1	10	1
1	4	4	1	11	8
1	4	3	1	11	4
1	4	2	1	11	2
1	4	1	1	11	1
1	5	8	1	12	8
1	5	7	1	12	4
1	5	6	1	12	2
1	5	5	1	12	1
1	5	4	1	13	8
1	5	3	1	13	4
1	5	2	1	13	2
1	5	1	1	13	1
2	2	8	2	6	8
2	2	7	2	6	4
2	2	6	2	6	2
2	2	5	2	6	1
2	2	4	2	7	8
2	2	3	2	7	4
2	2	2	2	7	2
2	2	1	2	7	1
2	3	8	2	8	8
2	3	7	2	8	4
2	3	6	2	8	2
2	3	5	2	8	1
2	3	4	2	9	8
2	3	3	2	9	4
2	3	2	2	9	2
2	3	1	2	9	1
2	4	8	2	10	8
2	4	7	2	10	4
2	4	6	2	10	2
2	4	5	2	10	1
2	4	4	2	11	8
2	4	3	2	11	4
2	4	2	2	11	2
2	4	1	2	11	1
2	5	8	2	12	8
2	5	7	2	12	4
2	5	6	2	12	2
2	5	5	2	12	1
2	5	4	2	13	8
2	5	3	2	13	4
2	5	2	2	13	2
2	5	1	2	13	1

HF-80XX 2-CHANNEL RADIO-CHANNEL RADIOS AND HF-80XX 2-CHANNEL CONTROL-CHANNEL CONTROLS			
PARALLEL OUTPUT PIN NO.	PARALLEL INPUT PIN NO.	FUNCTION	FUNCTION
103	38	COMMAND	COMMAND (C)
129	129	STATUS REQUEST	STATUS REQUEST (S)
64	64	FREQ 10 MHz	NOT USED
128	128	FREQ 10 MHz	VBFO SIGN
63	63	FREQ 1 MHz	VBFO FREQ 1 kHz (8)
127	127		(4)
62	62		(2)
126	126	FREQ 100 kHz	VBFO FREQ 100 Hz (8)
61	61		(4)
125	125		(2)
60	60		(1)
124	124	FREQ 10 kHz	VBFO FREQ 10 Hz (8)
59	59		(4)
123	123		(2)
58	58		(1)
122	122	FREQ 1 kHz	NOT USED
57	57		
121	121		
56	56	FREQ 100 Hz	
120	120		
55	55		
119	119		
54	54		
118	118	FREQ 10 Hz	NOT USED
53	53		
117	117		
52	52	FREQ 1 Hz	PILOT CARRIER ENBL
116	116		PA L PWR ENBL
51	51		PA HV ENBL
115	115		PA LV ENBL
50	50		
103	38	COMMAND	COMMAND (C)
76	76	STATUS REQUEST	STATUS REQUEST (S)
11	11	NOT USED	NOT USED
75	75	RF GAIN	REMOTE KEY (MON)
10	10		NOT USED
22	87		
3		NOT USED	AFC LOCK
41	41	VBFO ENBL	EXCTR RF MON
106	106	AFC ENBL	CHAN A XMT AF MON
37	37	AGC CROWBAR EN	CHAN A RCV AF MON
84	84	USB AGC OFF	CHAN A AGC MON
85	85	USB AGC FAST	CHAN B XMT MON
19	19	LSB AGC OFF	CHAN B RCV MON
20	20	LSB AGC FAST	CHAN B AGC MON
100	100	FL8 ENBL	PA RDY
99	99	FL7 ENBL	PA FLT
35	35	FL6 ENBL	PA RF MON
34	34	FL5 ENBL	CPLR FLT
98	98	FL4 ENBL	RF OVLD FLT
33	33	FL3 ENBL	SYNTH FLT
97	97	FL2 ENBL	PS FLT
32	32	FL1 ENBL	RCVR/EXCTR FLT
73	73	FM ENBL	NOT USED
8	8	AM ENBL	NOT USED
72	72	SSB ENBL	VBFO SYNTH FLT
9	9	CW ENBL	NOT USED
74	74	ISB ENBL	PRESEL FLT
6	6	RESERVED	DATA ERROR
26	91	RESERVED	LOCAL CONTROL
17	21	RESERVED	MONITOR

EQUIPMENT TYPE

851S - 1/2, HF-8095			
PARALLEL OUTPUT PIN NO.	PARALLEL INPUT PIN NO.	FUNCTION	FUNCTION
103	38	COMMAND	COMMAND (C)
107	107	STATUS REQUEST	STATUS REQUEST (S)
48	48	NOT USED	NOT USED
113	113	VBFO SIGN	VBFO FREQ 1 kHz (8)
47	47		(4)
112	112		(2)
46	46		(1)
111	111	VBFO FREQ 100 Hz (8)	
110	110		(4)
44	44		(2)
109	109		(1)
43	43	VBFO FREQ 10 Hz (8)	
108	108		(4)
42	42		(2)
7	7		(1)
8	8	NOT USED	
10	10		
9	9		
3	3		
5	5		
6	6		
4	4		
18	81	NOT USED	
82	82	VBFO TUNE	
78	78	VBFO PARALLEL ENBL	
14	14	FINE TUNE	
79	79	RESERVED	
103	38	COMMAND	COMMAND (C)
27	105	STATUS REQUEST	STATUS REQUEST (S)
92	68	UP/DOWN	UP/DOWN
28	4		(16)
29	39		(8)
95	5		(4)
30	70		(2)
(2)	2		(1)
(40)	40	NOT USED	
105		NOT USED	
36		CHAN A AF MON	
83		CHAN A AGC MON	
39		NOT USED	
101		CHAN B AF MON	
18		CHAN B AGC MON	
(69)	69	NOT USED	
(77)	4		
(5)	5		
(13)	70		
(67)	67	RF OVLD FLT	
49		SYNTH	
86		PS FLT	
(12)	3	RCVR FLT	
(70)		NOT USED	
(104)		NOT USED	
(27)	7	VBFO SYNTH FLT	
(92)		NOT USED	
(28)	71	PRESEL FLT	
(29)	95	DATA ERROR	
(95)	16	LOCAL CONTROL	
(30)	80	MONITOR	
(12)	13	NOT US	
92	68	EXCTR	
(68)	88	REMOTE	
23	23	B2 AF	
22	22	B1 AF	
24	24	A1 AF	
(2)	2	A2 AF	
(40)	40	NOT US	
105		10 Hz	
36		1 kHz	
83		10 kHz	
39		100 kHz	
101		SYNTH	
18		FREQ R	
(69)	69	NOT US	
(77)	4	SUBCAR	
(5)	5	EXCTR	
(13)	70	EXCTR	
(67)	67	NOT US	
49		EXT ST	
86		A1 IF	
(105)	3	NOT US	
(70)	77	PA REAR	
(104)	102	PA FLT	
(27)	7	PA RF	
(92)	89	CPLR FL	
(28)	71	PRESEL	
(29)	95	DATA ER	
(95)	16	LOCAL C	
(30)	80	MONITOR	

CONTROL / STATUS BIT					
WORD FORMAT			WORD FORMAT		
HF-80 8-BIT			ASCII 7-BIT		
WORD NO	CHARACTER NO	BIT NO	WORD NO	CHARACTER NO	BIT NO
1	2	8	1	6	8
1	2	7	1	6	4
1	2	6	1	6	2
1	2	5	1	6	1
1	2	4	1	7	8
1	2	3	1	7	4
1	2	2	1	7	2
1	2	1	1	7	1
1	3	8	1	8	8
1	3	7	1	8	4
1	3	6	1	8	2
1	3	5	1	8	1
1	3	4	1	9	8
1	3	3	1	9	4
1	3	2	1	9	2
1	3	1	1	9	1
1	4	8	1	10	8
1	4	7	1	10	4
1	4	6	1	10	2
1	4	5	1	10	1
1	4	4	1	11	8
1	4	3	1	11	4
1	4	2	1	11	2
1	4	1	1	11	1
1	5	8	1	12	8
1	5	7	1	12	4
1	5	6	1	12	2
1	5	5	1	12	1
1	5	4	1	13	8
1	5	3	1	13	4
1	5	2	1	13	2
1	5	1	1	13	1
2	2	8	2	6	8
2	2	7	2	6	4
2	2	6	2	6	2
2	2	5	2	6	1
2	2	4	2	7	8
2	2	3	2	7	4
2	2	2	2	7	2
2	2	1	2	7	1
2	3	8	2	8	8
2	3	7	2	8	4
2	3	6	2	8	2
2	3	5	2	8	1
2	3	4	2	9	8
2	3	3	2	9	4
2	3	2	2	9	2
2	3	1	2	9	1
2	4	8	2	10	8
2	4	7	2	10	4
2	4	6	2	10	2
2	4	5	2	10	1
2	4	4	2	11	8
2	4	3	2	11	4
2	4	2	2	11	2
2	4	1	2	11	1
2	5	8	2	12	8
2	5	7	2	12	4
2	5	6	2	12	2
2	5	5	2	12	1
2	5	4	2	13	8
2	5	3	2	13	4
2	5	2	2	13	2
2	5	1	2	13	1

EQUIPMENT TYPE		
HF-80XX 2-CHANNEL RADIOS AND HF-80XX 2-CHANNEL CONTROLS		
PARALLEL OUTPUT PIN NO	PARALLEL INPUT PIN NO	FUNCTION
103	103	COMMAND (C)
38	38	STATUS REQUEST (S)
129	129	FREQ 10 MHz (2)
64	64	FREQ 10 MHz (1)
128	128	FREQ 1 MHz (8)
63	63	FREQ 1 MHz (4)
127	127	FREQ 1 MHz (2)
62	62	FREQ 1 MHz (1)
126	126	FREQ 100 kHz (8)
61	61	FREQ 100 kHz (4)
125	125	FREQ 100 kHz (2)
60	60	FREQ 100 kHz (1)
124	124	FREQ 10 kHz (8)
59	59	FREQ 10 kHz (4)
123	123	FREQ 10 kHz (2)
58	58	FREQ 10 kHz (1)
122	122	FREQ 1 kHz (8)
57	57	FREQ 1 kHz (4)
121	121	FREQ 1 kHz (2)
56	56	FREQ 1 kHz (1)
120	120	FREQ 100 Hz (8)
55	55	FREQ 100 Hz (4)
119	119	FREQ 100 Hz (2)
54	54	FREQ 100 Hz (1)
118	118	FREQ 10 Hz (8)
53	53	FREQ 10 Hz (4)
117	117	FREQ 10 Hz (2)
52	52	FREQ 10 Hz (1)
116	116	FREQ 1 Hz (8)
51	51	FREQ 1 Hz (4)
115	115	FREQ 1 Hz (2)
50	50	FREQ 1 Hz (1)
103	103	COMMAND (C)
38	38	STATUS REQUEST (S)
76	76	RF GAIN (16)
11	11	RF GAIN (8)
75	75	RF GAIN (4)
10	10	RF GAIN (2)
22	87	RF GAIN (1)
3	3	NOT USED
41	41	VBFO ENBL
106	106	AFC ENBL
37	37	AGC CROWBAR ENBL
84	84	USB AGC OFF
85	85	USB AGC FAST
19	19	LSB AGC OFF
20	20	LSB AGC FAST
100	100	FL8 ENBL
99	99	FL7 ENBL
35	35	FL6 ENBL
34	34	FL5 ENBL
98	98	FL4 ENBL
33	33	FL3 ENBL
97	97	FL2 ENBL
32	32	FL1 ENBL
73	73	FM ENBL
8	8	AM ENBL
72	72	SSB ENBL
9	9	CW ENBL
74	74	ISB ENBL
6	92	RESERVED
26	91	RESERVED
17	21	RESERVED

EQUIPMENT TYPE		
85IS-1/2, HF-8095		
PARALLEL OUTPUT PIN NO	PARALLEL INPUT PIN NO	FUNCTION
103	103	COMMAND (C)
38	38	STATUS REQUEST (S)
129	129	FREQ 10 MHz (2)
64	64	FREQ 10 MHz (1)
128	128	FREQ 1 MHz (8)
63	63	FREQ 1 MHz (4)
127	127	FREQ 1 MHz (2)
62	62	FREQ 1 MHz (1)
126	126	FREQ 100 kHz (8)
61	61	FREQ 100 kHz (4)
125	125	FREQ 100 kHz (2)
60	60	FREQ 100 kHz (1)
124	124	FREQ 10 kHz (8)
59	59	FREQ 10 kHz (4)
123	123	FREQ 10 kHz (2)
58	58	FREQ 10 kHz (1)
122	122	FREQ 1 kHz (8)
57	57	FREQ 1 kHz (4)
121	121	FREQ 1 kHz (2)
56	56	FREQ 1 kHz (1)
120	120	FREQ 100 Hz (8)
55	55	FREQ 100 Hz (4)
119	119	FREQ 100 Hz (2)
54	54	FREQ 100 Hz (1)
118	118	FREQ 10 Hz (8)
53	53	FREQ 10 Hz (4)
117	117	FREQ 10 Hz (2)
52	52	FREQ 10 Hz (1)
116	116	FREQ 1 Hz (8)
51	51	FREQ 1 Hz (4)
115	115	FREQ 1 Hz (2)
50	50	FREQ 1 Hz (1)
103	103	COMMAND (C)
38	38	STATUS REQUEST (S)
76	76	RF GAIN (16)
11	11	RF GAIN (8)
75	75	RF GAIN (4)
10	10	RF GAIN (2)
22	87	RF GAIN (1)
3	3	NOT USED
41	41	VBFO ENBL
106	106	RESERVED
37	37	AGC CROWBAR ENBL
84	84	USB AGC OFF
85	85	USB AGC FAST
19	19	LSB AGC OFF
20	20	LSB AGC FAST
100	100	FL8 ENBL
99	99	FL7 ENBL
35	35	FL6 ENBL
34	34	FL5 ENBL
98	98	FL4 ENBL
33	33	FL3 ENBL
97	97	FL2 ENBL
32	32	FL1 ENBL
73	73	FM ENBL
8	8	AM ENBL
72	72	SSB ENBL
9	9	CW ENBL
74	74	ISB ENBL
6	92	RESERVED
26	91	RESERVED
17	21	RESERVED

EQUIPMENT TYPE		
4-CHANNEL EXCITER, AND 4-CHANNEL EXCITER CONTROL		
PARALLEL OUTPUT PIN NO	PARALLEL INPUT PIN NO	FUNCTION
		NOT USED
		NOT USED
129	129	FREQ 10 MHz (2)
64	64	FREQ 10 MHz (1)
128	128	FREQ 1 MHz (8)
63	63	FREQ 1 MHz (4)
127	127	FREQ 1 MHz (2)
62	62	FREQ 1 MHz (1)
126	126	FREQ 100 kHz (8)
61	61	FREQ 100 kHz (4)
125	125	FREQ 100 kHz (2)
60	60	FREQ 100 kHz (1)
124	124	FREQ 10 kHz (8)
59	59	FREQ 10 kHz (4)
123	123	FREQ 10 kHz (2)
58	58	FREQ 10 kHz (1)
122	122	FREQ 1 kHz (8)
57	57	FREQ 1 kHz (4)
121	121	FREQ 1 kHz (2)
56	56	FREQ 1 kHz (1)
120	120	FREQ 100 Hz (8)
55	55	FREQ 100 Hz (4)
119	119	FREQ 100 Hz (2)
54	54	FREQ 100 Hz (1)
118	118	FREQ 10 Hz (8)
53	53	FREQ 10 Hz (4)
117	117	FREQ 10 Hz (2)
52	52	FREQ 10 Hz (1)
116	116	FREQ 1 Hz (8)
51	51	FREQ 1 Hz (4)
115	115	FREQ 1 Hz (2)
50	50	FREQ 1 Hz (1)
		NOT USED
76	76	RF GAIN (16)
11	11	RF GAIN (8)
75	75	RF GAIN (4)
10	10	RF GAIN (2)
22	87	RF GAIN (1)
3	12	NOT USED
41	41	NOT USED
106	106	NOT USED
37	37	NOT USED
84	84	NOT USED
85	85	NOT USED
19	19	NOT USED
20	20	NOT USED
100	100	NOT USED
99	99	NOT USED
35	35	NOT USED
34	34	NOT USED
98	98	NOT USED
33	33	NOT USED
97	97	NOT USED
32	32	NOT USED
73	73	NOT USED
8	8	NOT USED
72	72	NOT USED
9	9	NOT USED
74	74	NOT USED
6	92	NOT USED
26	91	NOT USED
17	21	NOT USED

EQUIPMENT TYPE		
4-CHANNEL RECEIVER, AND 4-CHANNEL RECEIVER CONTROL		
PARALLEL OUTPUT PIN NO	PARALLEL INPUT PIN NO	FUNCTION
		NOT USED
		NOT USED
129	129	FREQ 10 MHz (2)
64	64	FREQ 10 MHz (1)
128	128	FREQ 1 MHz (8)
63	63	FREQ 1 MHz (4)
127	127	FREQ 1 MHz (2)
62	62	FREQ 1 MHz (1)
126	126	FREQ 100 kHz (8)
61	61	FREQ 100 kHz (4)
125	125	FREQ 100 kHz (2)
60	60	FREQ 100 kHz (1)
124	124	FREQ 10 kHz (8)
59	59	FREQ 10 kHz (4)
123	123	FREQ 10 kHz (2)
58	58	FREQ 10 kHz (1)
122	122	FREQ 1 kHz (8)
57	57	FREQ 1 kHz (4)
121	121	FREQ 1 kHz (2)
56	56	FREQ 1 kHz (1)
120	120	FREQ 100 Hz (8)
55	55	FREQ 100 Hz (4)
119	119	FREQ 100 Hz (2)
54	54	FREQ 100 Hz (1)
118	118	FREQ 10 Hz (8)
53	53	FREQ 10 Hz (4)
117	117	FREQ 10 Hz (2)
52	52	FREQ 10 Hz (1)
116	116	FREQ 1 Hz (8)
51	51	FREQ 1 Hz (4)
115	115	FREQ 1 Hz (2)
50	50	FREQ 1 Hz (1)
		NOT USED
76	76	RF GAIN (16)
11	11	RF GAIN (8)
75	75	RF GAIN (4)
10	10	RF GAIN (2)
22	87	RF GAIN (1)
3	12	FL7 (E) ENBL
41	41	FL6 (D) ENBL
106	106	FL5 (C) ENBL
37	37	FL4 (B) ENBL
84	84	B2 AGC (2)
85	85	B2 AGC (1)
19	19	A2 AGC (2)
20	20	A2 AGC (1)
100	100	FL3 (A) ENBL
99	99	FL1 (16 kHz) ENBL
35	35	VBFO ENBL
34	34	AFC ENBL
98	98	B1 AGC (2)
33	33	B1 AGC (1)
97	97	A1 AGC (2)
32	32	A1 AGC (1)
73	73	DATA NET ENBL
8	8	AM ENBL
72	72	CW ENBL
9	9	ISB ENBL
74	74	B2 ENBL
6	92	B1 ENBL
26	91	A1 ENBL
17	21	A2 ENBL

CONTROL / STATUS BIT					
WORD FORMAT					
HF-80 8-BIT			ASCII 7-BIT		
WORD NO	CHARACTER NO	BIT NO.	WORD NO.	CHARACTER NO	BIT WT
3	2	8	3	6	8
3	2	7	3	6	4
3	2	6	3	6	2
3	2	5	3	6	1
3	2	4	3	7	8
3	2	3	3	7	4
3	2	2	3	7	2
3	2	1	3	7	1
3	3	8	3	8	8
3	3	7	3	8	4
3	3	6	3	8	2
3	3	5	3	8	1
3	3	4	3	9	8
3	3	3	3	9	4
3	3	2	3	9	2
3	3	1	3	9	1
3	4	8	3	10	8
3	4	7	3	10	4
3	4	6	3	10	2
3	4	5	3	10	1
3	4	4	3	11	8
3	4	3	3	11	4
3	4	2	3	11	2
3	4	1	3	11	1
3	5	8	3	12	8
3	5	7	3	12	4
3	5	6	3	12	2
3	5	5	3	12	1
3	5	4	3	13	8
3	5	3	3	13	4
3	5	2	3	13	2
3	5	1	3	13	1
4	2	8	4	6	8
4	2	7	4	6	4
4	2	6	4	6	2
4	2	5	4	6	1
4	2	4	4	7	8
4	2	3	4	7	4
4	2	2	4	7	2
4	2	1	4	7	1
4	3	8	4	8	8
4	3	7	4	8	4
4	3	6	4	8	2
4	3	5	4	8	1
4	3	4	4	9	8
4	3	3	4	9	4
4	3	2	4	9	2
4	3	1	4	9	1
4	4	8	4	10	8
4	4	7	4	10	4
4	4	6	4	10	2
4	4	5	4	10	1
4	4	4	4	11	8
4	4	3	4	11	4
4	4	2	4	11	2
4	4	1	4	11	1
4	5	8	4	12	8
4	5	7	4	12	4
4	5	6	4	12	2
4	5	5	4	12	1
4	5	4	4	13	8
4	5	3	4	13	4
4	5	2	4	13	2
4	5	1	4	13	1



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0770713-001211

1 January 1981

Serial Interface (638-6896-001)

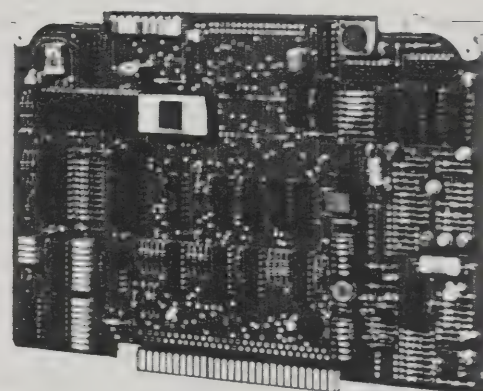
Printed in USA

Serial Interface
(638-6896-001)

1. DESCRIPTION

Serial Interface 638-6896-001, shown in figure 1, is a 2-layer planar card with a 56-pin edge-on connector (2 layers, 28 pins each).

The serial interface card consists of the following primary circuits; an FSK/RS-232 select switch, an FSK receiver, an RS-232 receiver, an asynchronous communications interface adapter (ACIA), a microprocessor circuit, a parallel-to-serial output shift register, a strobe decoder, a word subaddress latch, a bit/band rate and clock generator, data input buffers, an FSK keyer, FSK transmit enable gate, and an RS-232 driver.



TPA-2843-017

Serial Interface
Figure 1

2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 2.)

As a serial data receiver, the serial interface card receives FSK, RS-232C, or MIL-STD-188C serial data control signals and checks for address, command status, and data errors. It then provides error, clock, word subaddress, strobe, and serial data outputs for decoding by a parallel output card.

As a serial data transmitter, the serial interface card receives parallel data inputs and a transmit word initiate and provides FSK, RS-232C, or MIL-STD-188C serial data monitor signals. The serial data monitor signals are supplied to the associated unit/control.

2.2 Serial Data Inputs and Outputs

When strapped accordingly, the serial interface card receives and transmits data according to one of the following types of control techniques.

- FSK (mark = 1280 Hz, space = 2133 Hz) with mark equivalent to logic 1 data and space equivalent to logic 0 data. Data is transmitted/received at 75, 109, 150, 300, or 600 bauds.
- EIA RS-232C (mark = -6 ± 1 V dc, space = $+6 \pm 1$ V dc) with mark equivalent to logic 1 data and space equivalent to logic 0 data. Data is transmitted/received at 75, 109, 150, 300, 600, 1200, 2400, 4800, 9600, or 19,200 bauds.
- MIL-STD-188C (mark = $+6 \pm 1$ V dc, space = -6 ± 1 V dc) with mark equivalent to logic 1 data and space equivalent to logic 0 data. Data is transmitted/received at 75, 109, 150, 300, 600, 1200, 2400, 4800, 9600, or 19,200 bauds.

The control word inputs may be in either HF-80 8-bit format or ASCII 7-bit format. When applied to the asynchronous communications interface adapter, the

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control word is reformatted so that each control word is composed of five 11-bit characters. The last two or three bits of each character group are stop and parity bits. The first bit is a start bit. In the 8-bit format, the first character of each control word is reserved for equipment address, word identification (subaddress), and word sync information. Bits seven and eight of the second character in each word are reserved for command and status request control bits. The remaining characters of each word carry frequency, control, and monitor information. In the 7-bit format, separate characters are used for equipment address, subaddress, word sync, and command and status request control bits.

Refer to figure 3. Control (and monitor) word timing is accomplished by a crystal-controlled oscillator on the microprocessor chip. A divider reduces the frequency to the desired values. Strapping permits selection of the baud rate for clock inputs to the various circuits. Selection is from 75, 109, 150, 300, 600, 1200, 2400, 4800, 9600, and 19,200 bauds. (Clock frequency is 16 times baud rate).

Refer to figure 2. Monitor data (serial data input) is applied to the microprocessor on the serial interface card. Word and status information is decoded from the monitor data and is used to determine strobe address information. The monitor data is then applied serially through a shift register to the data input of four word serial-to-parallel converters on the associated parallel output card. Each serial-to-parallel converter is enabled before it accepts and processes the monitor data. This occurs when the strobe address input is decoded and an enable signal is generated by the word enable circuit.

Refer to figure 2. Control information (serial data output) is stored in the multiplexers on the associated parallel input card. Mux control is supplied by the microprocessor through the multiplexer output latch on the serial interface card. The mux address information enables the applicable multiplexer on the parallel input card, which transfers the stored parallel information to the serial interface card. The serial interface card then formats the information into 8-bit or 7-bit format and outputs it serially, using the ACIA, through the FSK keyer or RS-232C driver circuit to the control data output.

2.3 Monitor Data (Refer to figure 2.)

Monitor data (serial data input) is received by the FSK/RS-232C select and applied to the appropriate receiver. In FSK, the FSK receiver applies the received FSK signal to the FSK demodulator where a

1280-Hz signal is converted to a logic 1 output and a 2133-Hz signal is converted to a logic 0 output.

In RS-232C or MIL-STD-188C operation, the RS-232C receiver converts a +6-V dc input to a logic 0 (ground) output and converts a -6-V dc input to a logic 1 (+4.7-V dc) output.

The asynchronous communications interface adapter (ACIA) receives the monitor data input and converts it to HF-80 8-bit format and applies it to the microprocessor. If the monitor data is command data (command bit = 0), the microprocessor converts the data word to parallel receive data outputs and clocks the data through the parallel to serial converter to the appropriate storage registers on the parallel output card. The serial interface card then supplies the word subaddress and strobe so that the data is accepted into the appropriate storage register in the associated parallel output card as determined by the word subaddress.

2.4 Control Data (Refer to figure 2.)

Control data (serial data output) is transmitted by an FSK keyer (for FSK operation) or by a line driver (for RS-232C or MIL-STD-188C operation).

In FSK operation, the FSK keyer converts logic 0 outputs from the asynchronous communications interface adapter (ACIA) to 1280-Hz FSK signals and logic 1 outputs from the ACIA to 2133 Hz.

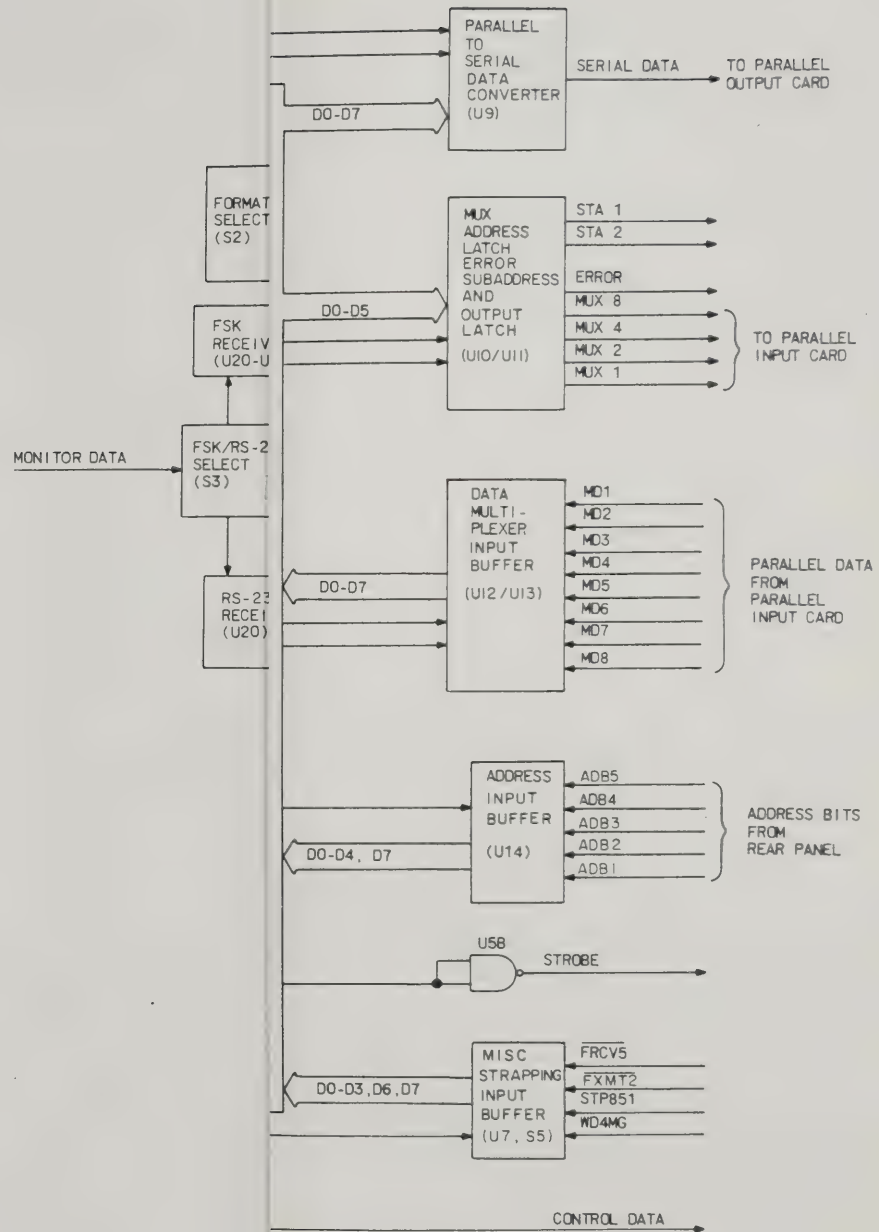
In RS-232 operation, the line driver converts logic 0 inputs to the line driver to +6 V dc and logic 1 inputs to the line driver to -6 V dc.

In MIL-STD-188C operation, the line driver converts logic 0 inputs to the line driver to -6 V dc and logic 1 line inputs to the line driver to +6 V dc.

Parallel input data are address selected by the microprocessor and applied to the ACIA. The ACIA supplies the data as serial output (so) data to the line driver or FSK keyer. The serial data is converted to the appropriate signal data and supplied to the associated remote unit/control.

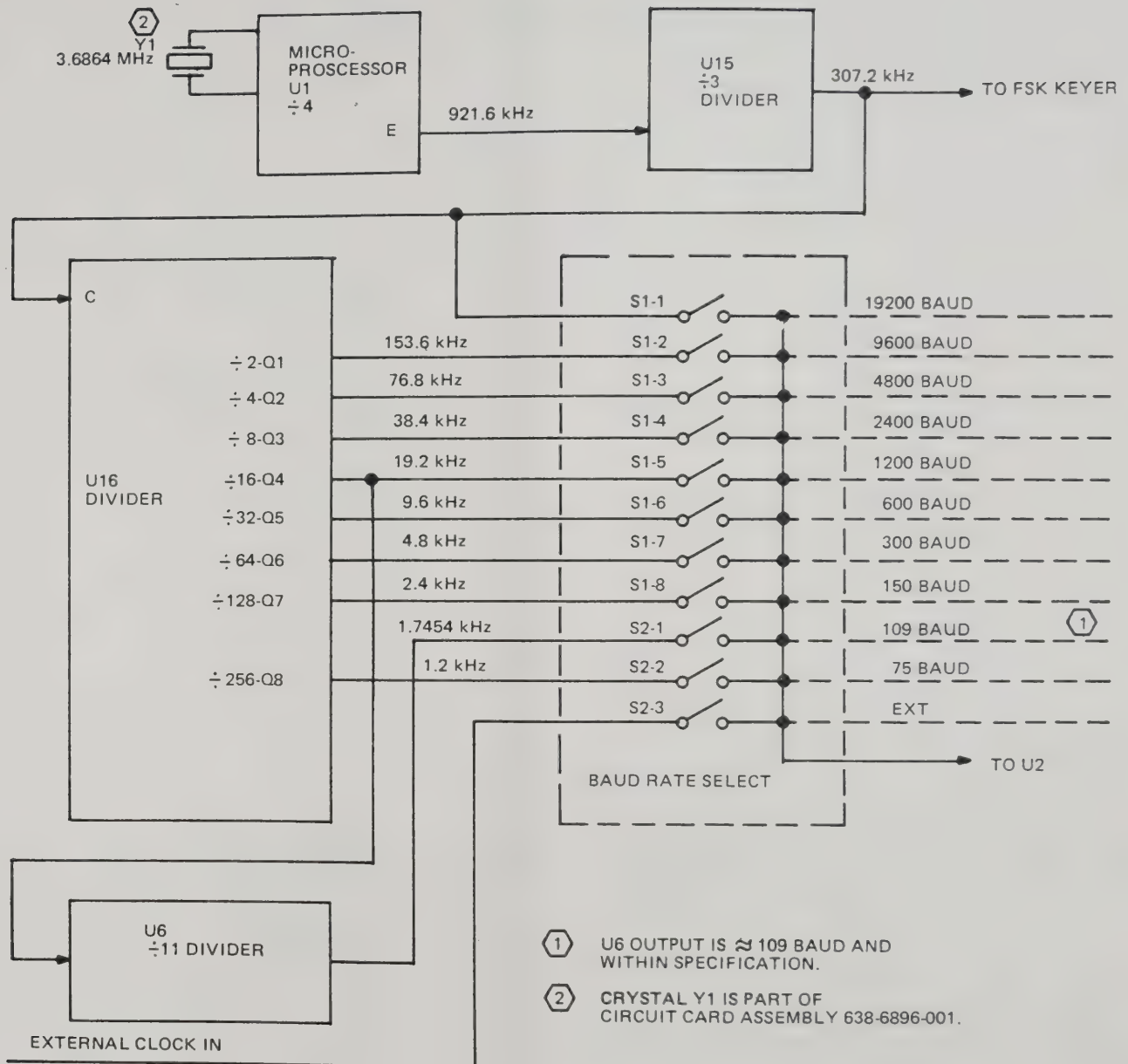
2.5 Purpose of Strapping

Unit strapping is accomplished using five dipswitches located on the UUT, S1 through S5. These control baud rate, FSK/RS-232 signaling, word format, EIA/MIL-STD-188C polarity, parity, number of stop bits, radio or control, and address recognition enable/disable. The card outline in figure 4 shows the location of these dipswitches. Switch 1 of each dipswitch is towards the top of the card.



TPA-2671-014

Serial Interface, Block Diagram
Figure 2



TPA-2678-011

Bit and Baud Rate Generator, Block Diagram
Figure 3

2.5.5 Address Recognition

Open switch 1 of S5 to enable address recognition. Close switch 1 of S5 to disable address recognition. When address recognition is disabled, the UUT will accept a word with any address if the word is otherwise correct.

2.5.6 Radio/Control Selection

Open switch 5 of S2 for radio. Close switch 5 of S2 for control.

All eight of the switches in S1 and switches 1, 2, and 3 of S2 control the baud rate. Closing one and only one of these switches will select the baud rate as given:

BAUD RATE SELECTION		
DIPSWITCH	SWITCH	BAUD RATE
S1	1	19,200
S1	2	9,600
S1	3	4,800
S1	4	2,400
S1	5	1,200
S1	6	600
S1	7	300
S1	8	150
S2	1	109
S2	2	75
S2	8	EXTERNAL

2.5.7 Polling Control

In addition to the internal strapping options listed above, an additional strapping option permits a control unit to function in a polling mode of operation. This mode of operation is intended for use when an auxiliary system status display is used to display the current status of several or more remote equipments.

In the polling mode of operation, the control unit automatically and sequentially requests status information from all sixteen possible remote addresses. As a status information is received from each addressed remote unit, it is then transmitted by the control unit, on the common system control bus, to a remote status display for update of the display. The remote status display must be connected to the system control bus to receive the updated display information. If no status response is received from a polled unit, no status data is transmitted to the status display by the control unit.

Since the status display device connects to the common system control bus, it is programmed to recognize its own unique address, and the remote control unit is programmed to use this same address (00-000 for ADB5 through ADB1) when communicating with the status display. Therefore, when using the polling capability along with an external system status display and the 8-bit byte character data format, only fifteen of the sixteen address combinations are available for remote unit assignment, since the display unit itself requires one of the addresses. If, however, the 7-bit ASCII character data format is used in the system, all sixteen remote unit addresses are available for use because the address assigned to the status display is not among the sixteen addresses (of the 32 possible in this format) controlled by the thumbwheel address selector switch of the remote control unit.

Open switch 2 of S5 to disable polling. Close switch 2 of S5 to enable polling.

2.6 Asynchronous Communications Interface Adapter (ACIA) (Refer to figure 5.)

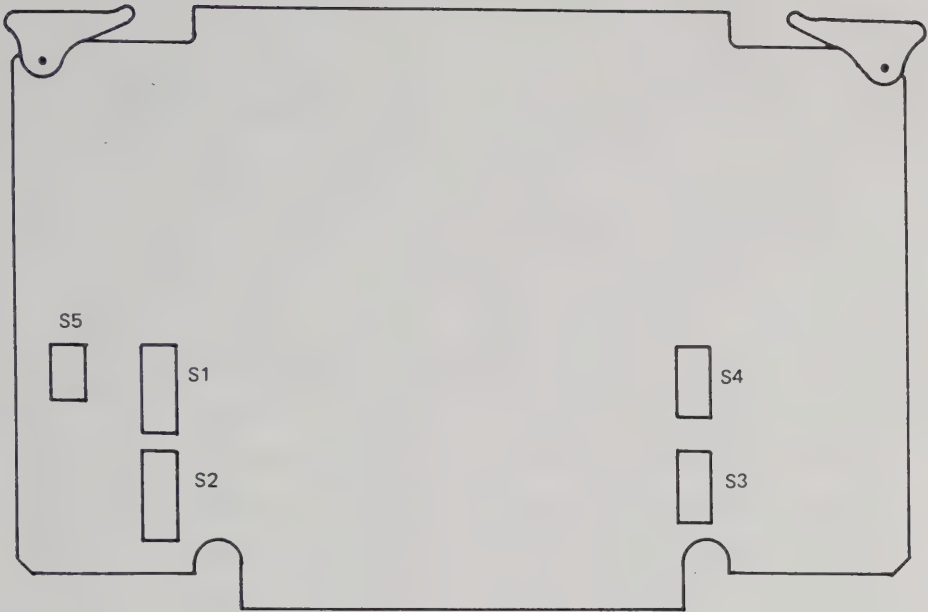
The ACIA is an LSI subsystem which allows the user to use either ASCII or HF-80 8-bit word formatting. When used in conjunction with a microprocessor, the ACIA has the flexibility to handle various baud rates, parity modes, bits per word, and number of stop bits per word. The device is constructed on a single 24-lead dual-in-line package. All inputs and outputs are directly compatible with MTOS/MTNS logic, and also with TTL/DTL/CMOS logic without the need for interfacing components. The strobed outputs (D0 through D7) are interfaced directly with the microprocessor data bus.

2.7 Processor (Refer to figure 2.)

Processor circuit controls all operations on the serial interface card through the use of a software program packaged in a 16K (2K x 8) EPROM.

The processor circuit consists of the following components with associated gating circuits:

- Microprocessing unit (MPU)
- Electrically programmable read-only memory (EPROM)
- ACIA
- Clock generator
- I/O enable generator



TPA-2674-011

Dipswitch Location
Figure 4

Address strapping is accomplished by applying the necessary logic levels to ADB1 through ADB5 (pins 41, 14, 40, 39, and 15 respectively).

2.5.1 FSK Control

Close only switches 1, 2, and 3 of S3 and S4 for FSK. Open switch 4 of S2 for FSK (to provide EIA data polarity).

2.5.2 RS-232C Control

Close only switches 4, 5, and 6 of S3 and S4 for RS-232C.

2.5.3 EIA-MIL-STD-188C Control

Open switch 4 of S2 for EIA data polarity. Close switch 4 of S2 for MIL-STD-188C polarity.

2.5.4 Parity, HF-ASCII Word Format, and Number of Stop Bits

Switches 6, 7, and 8 of S2 control the basic character format according to tabulation below:

*SWITCH			WORD FORMAT	PARITY	NO OF STOP BITS
8	7	6			
C	C	C	ASCII	Even	2
C	C	O	ASCII	Odd	2
C	O	C	ASCII	Even	1
C	O	O	ASCII	Odd	1
O	C	C	HF-80	None	2
O	C	O	HF-80	None	1
O	O	C	HF-80	Even	1
O	O	O	HF-80	Odd	1
*O = Open, C = Closed					

2.7.1 Microprocessor (Refer to figure 6.)

Microprocessing unit (MPU) is the central processing device. Through the software program, the MPU controls the receiving and transmitting of control and monitor information, address generation, strobe generation and timing, display programing, and system polling. The MPU is controlled by the following inputs:

- Clock - Provides timing/gating signals. The crystal mounted external to the MPU provides a stable reference which is divided by four on the MPU.
- Reset - Used to reset and start MPU from a power-down condition resulting from a power failure or initial startup.

The MPU generates two control signals that are used to enable peripherals: valid memory address (VMA) and read/write ($R/\bar{W}$). The VMA signal is gated with the clock in U5A and then is applied to I/O enable generator U4. This signal indicates to the peripherals that a valid memory address from the MPU is on the address bus. The $R/\bar{W}$ output signal is used by the ACIA to set its circuits in a read or write operation. The 8-bit data bus (D0 through D7) provides bidirectional bus for transferring data to and from memory and the peripherals. The address bus (A0 through A15), a 16-bit bus, provides 65 kilabytes of addressing for the MPU to retrieve and transmit information.

The reset pulse is generated by U29 whenever the +5 V dc is interrupted and then reapplied.

2.7.2 EPROM (Refer to figure 7.)

The electrically programmable read-only memory (U3) contains the program for the MPU. The program in the EPROM controls the MPU after startup. The MPU communicates with the EPROM through the address bus and the data bus. The EPROM consists of a 16, 384-bit cell matrix, X and Y address decoders, Y gating circuit, output data buffers and program circuits. The EPROM is packaged in a ceramic, 24-lead dual-in-line package and is TTL, CMOS, and DTL logic compatible.

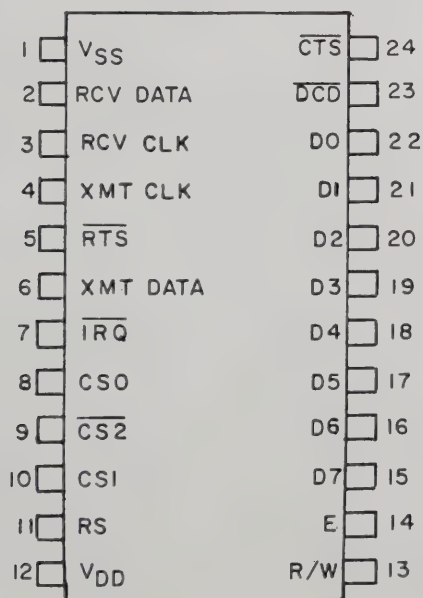
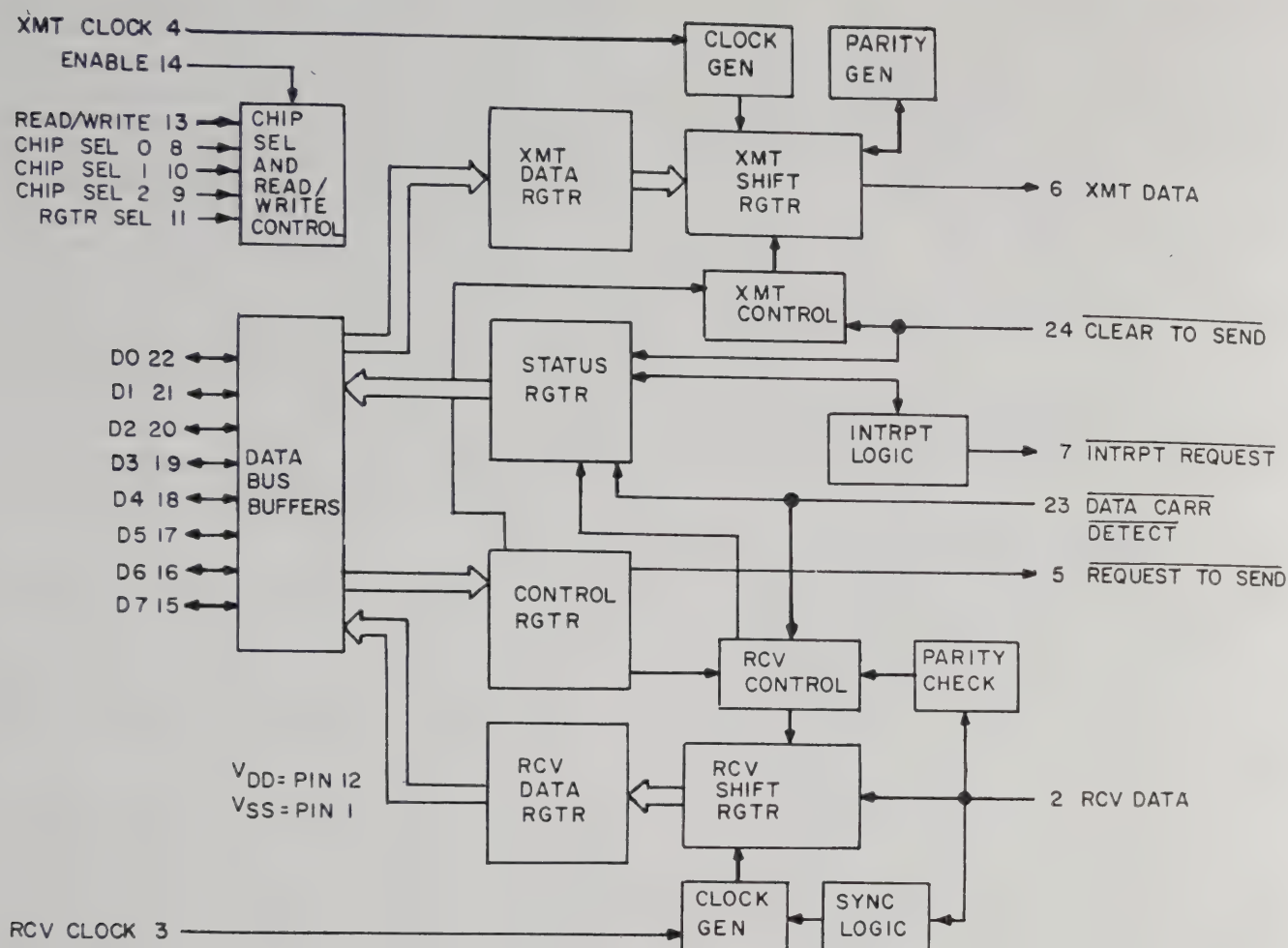
2.7.3 I/O Generator - Decoder/Demultiplexer (Refer to figure 8.)

I/O enable generator U4 is a binary decoder that decodes address bus lines A0, A1, A2, and A3, (refer to table 1) generating enabling signals to enable the

Table 1. I/O Generator Truth Table.

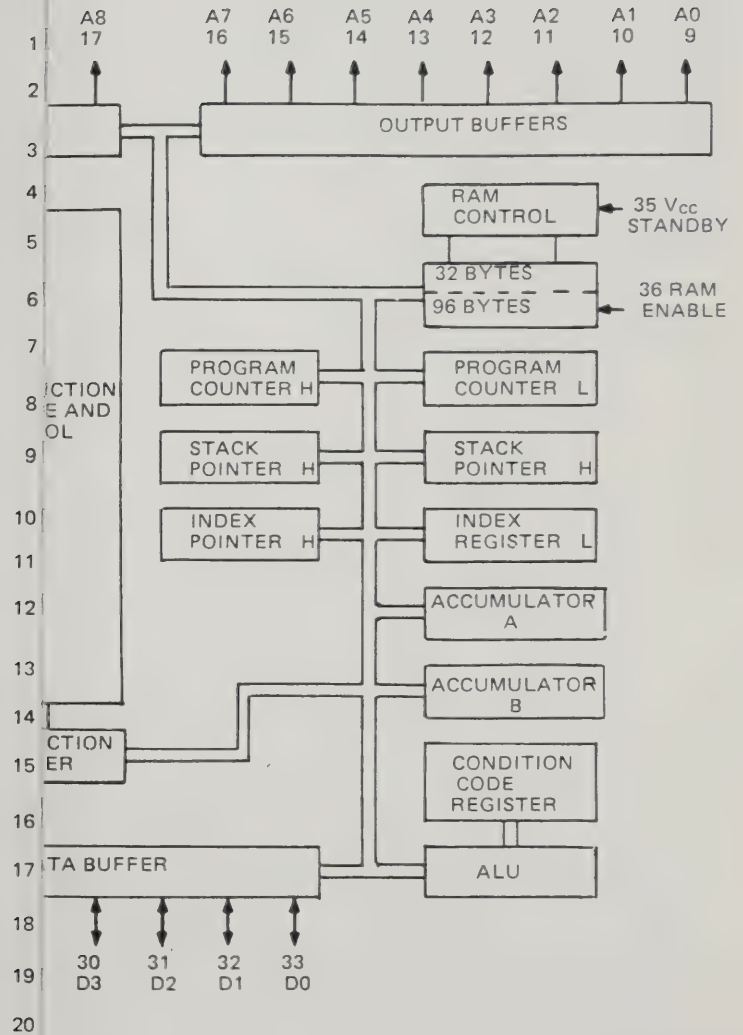
INPUTS					OUTPUTS																
G1	G2	D	C	B	A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	H	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	L	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H
L	L	L	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H
L	L	H	L	L	L	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H
L	L	H	L	L	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H
L	L	H	L	H	L	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H
L	L	H	L	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H
L	L	H	H	L	L	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H	H
L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H
L	L	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H
L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	H
L	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	L	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
H = High level, L = Low level, X = Don't care																					

H = High level, L = Low level, X = Don't care



TPA-2673-011

Asynchronous Communications Interface Adapter 351-8455-010
Figure 5



TPA-2672-013

Microprocessor 351-8676-010

Figure 6

various input and output decoders and the ACIA. The I/O generator employs low-power Schottky transistor-to-transistor logic (TTL) and is packaged in a dual-in-line configuration.

2.8 Noninverting, 3-State Buffer *(Refer to figure 9.)*

Data multiplexer inputs U12, U13, address select inputs U14, and miscellaneous strapping input are accessed by the processor through noninverting, 3-state buffers. Inputs/outputs 1 through 4 are controlled by disable A while inputs/outputs 5 and 6 are controlled by disable B.

3. TESTING AND TROUBLESHOOTING

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the serial interface card are

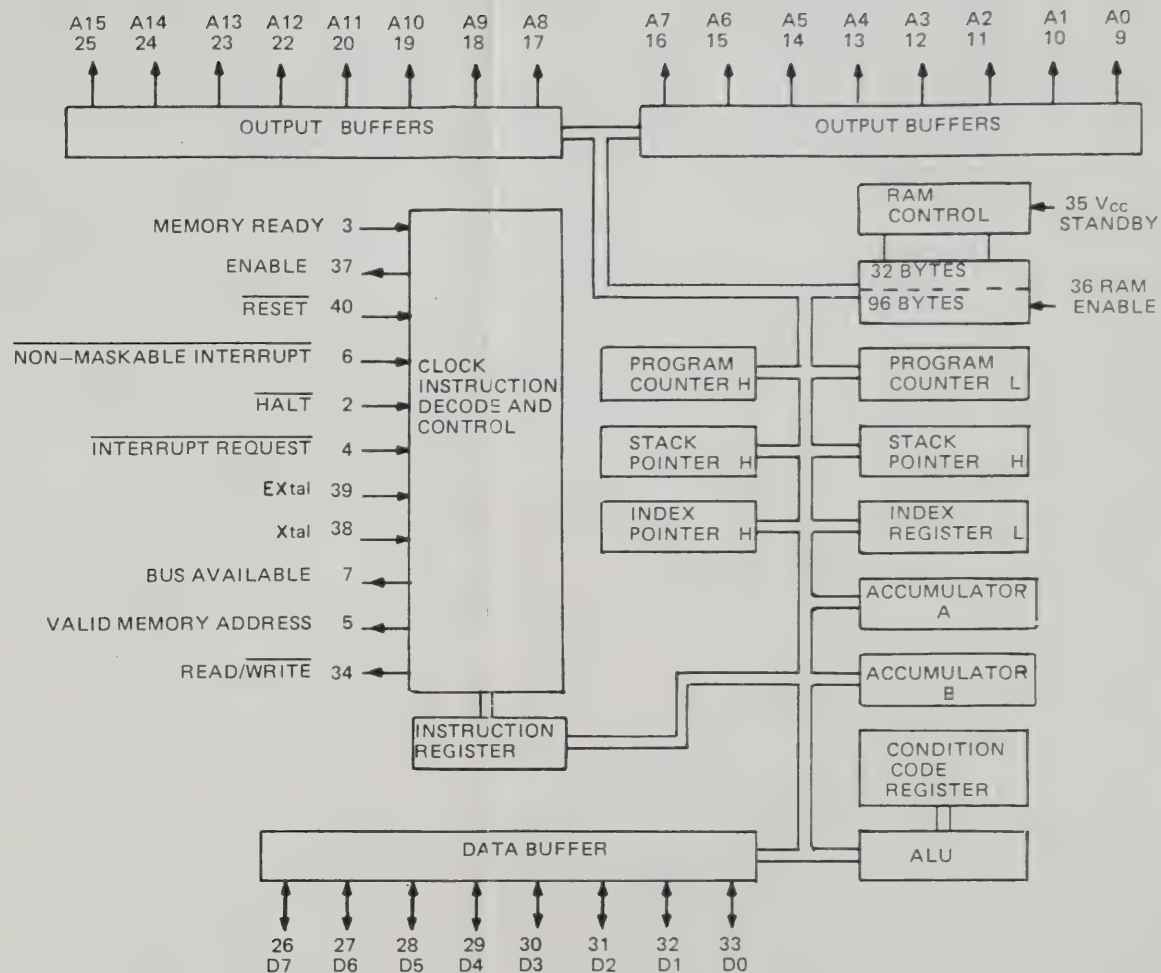
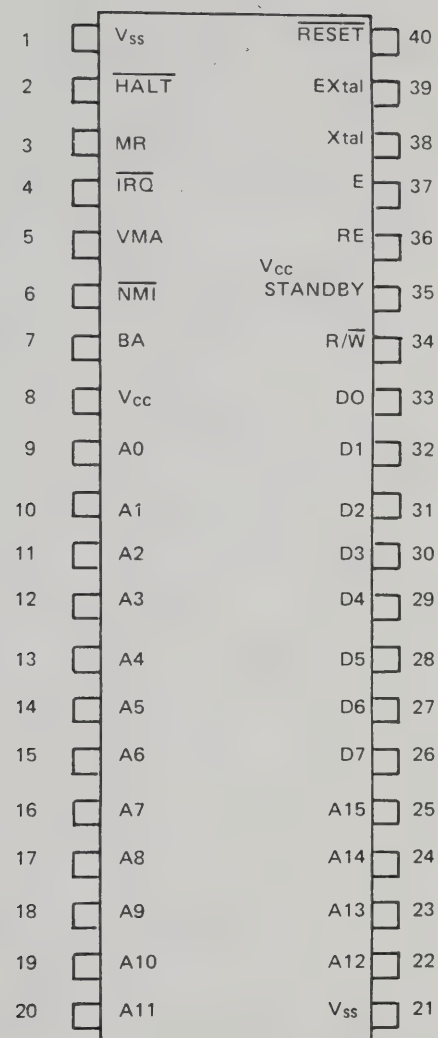
listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 2 check total performance of the serial interface card. These test procedures will confirm that a problem exists on the serial interface card and isolate it to a functional area.

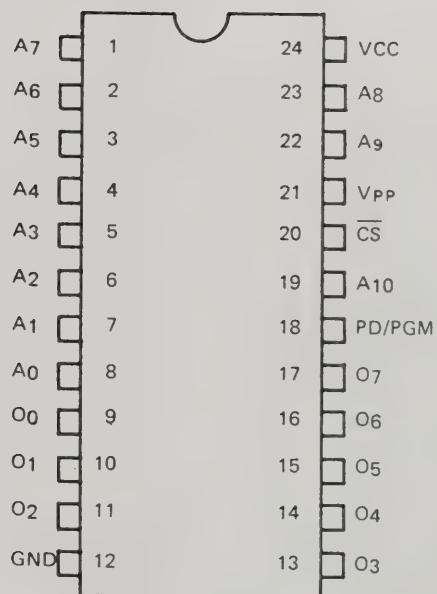
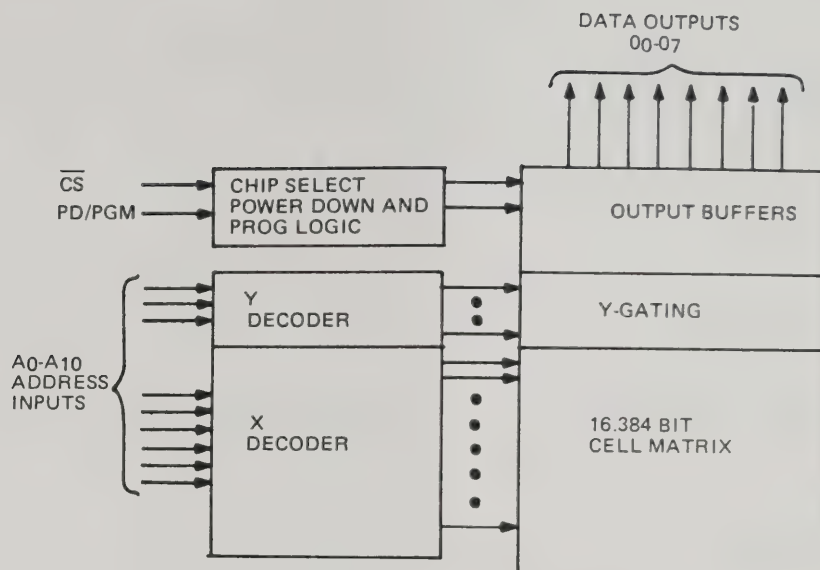
3.3 Troubleshooting

It is recommended that the serial interface card be returned to Collins Telecommunications Products Division for repair. The serial interface card is controlled by the microprocessor running a software program stored in the EPROM. It is necessary to have the software program and a method of controlling the program to isolate a fault to a specific component or circuit.



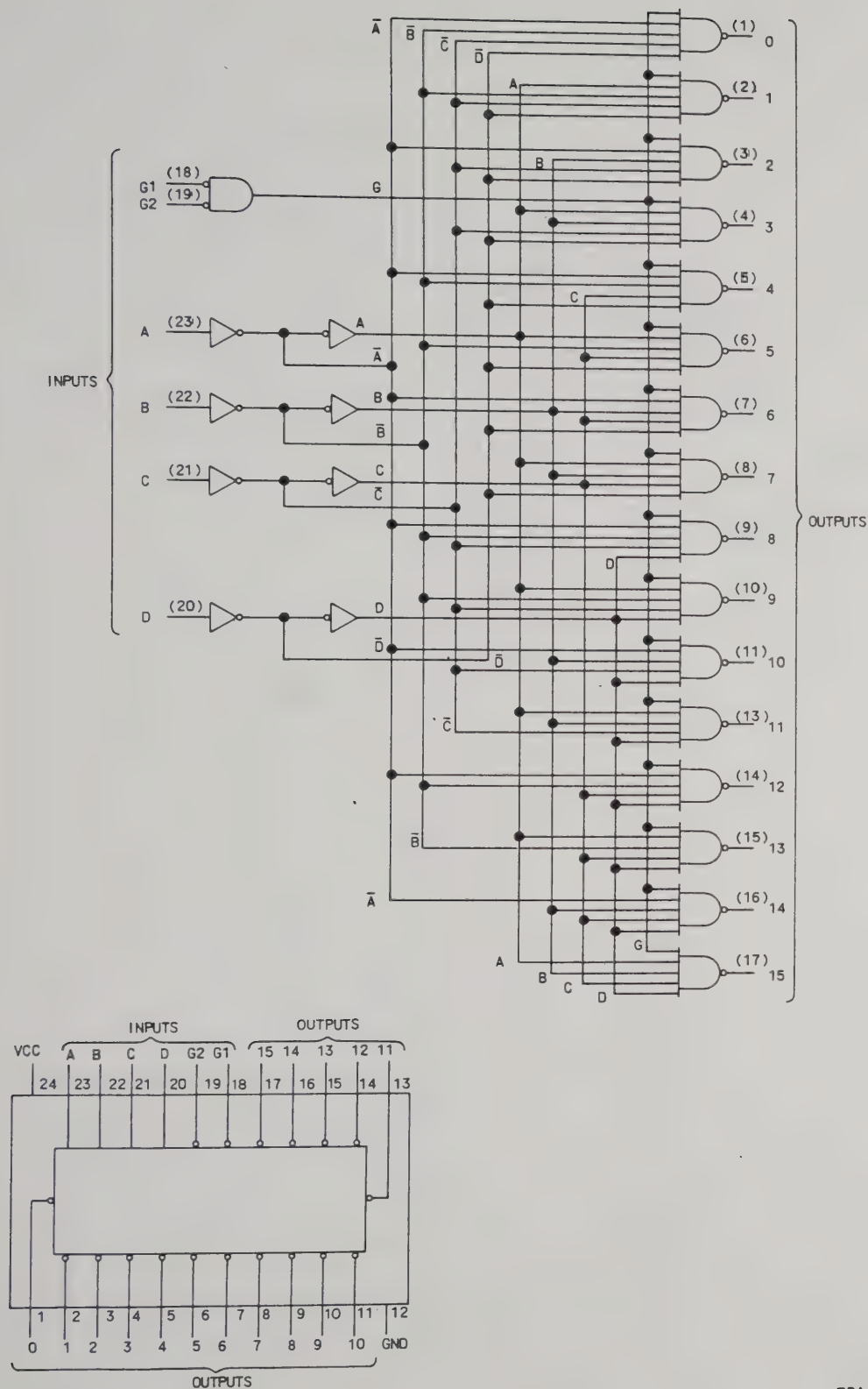
TPA-2672-013

Microprocessor 351-8676-010
Figure 6



TPA-2675-011

EPROM 647-2751-001
Figure 7



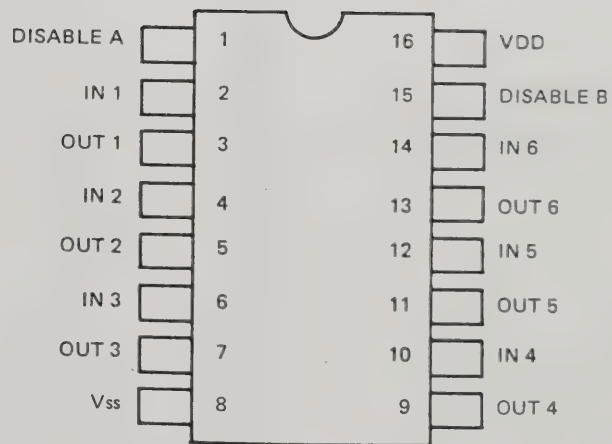
TPA-2677-014

Decode/Demultiplexer 351-1526-090
Figure 8

IN _n	APPROPRIATE DISABLE INPUT	OUT _n
0	0	0
1	0	1
X	1	HIGH IMPEDANCE

NOTE: X = DON'T CARE

TRUTH TABLE



PIN CONFIGURATION

TPA-2676-011

Noninverting, 3-State Buffer 351-8490-010
Figure 9

Table 2. Serial Interface, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	Note These testing and troubleshooting procedures are based on using a control unit and an associated local unit. The most effective method of testing and troubleshooting is obtained by installing the questionable serial interface in the control unit. During these tests when a control unit is referred to it is a receiver-exciter control, an exciter control, or a receiver control. When a local unit is referred to it is a receiver-exciter, an exciter, or a receiver. For all tests, the serial interface card is strapped for HF-80 8-bit format. (Refer to paragraph 2.5.4.) - Remove top cover of unit containing the serial interface to be tested. - Remove serial interface. Install it on an extender card and place it in the control unit. - Set unit LINE SELECTOR switches to 115 V. - Connect units to 115-V ac power source and set power on. - Measure dc voltages between the following pins and ground (TP1, brown): - J1-23 - J1-28 - J1-6 - Strap local unit for address 0. - Connect local unit to a control unit.	+15 $\pm$1.0 V dc. +5 $\pm$0.5 V dc. -15 $\pm$1.0 V dc.	Check associated power supply.
2. FSK data levels	Note UUT must be strapped for FSK operation. - Connect an audio voltmeter between J1-26 and J1-27. - Open EIA-MIL-STD-188C polarity switch.		
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont)

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	c. Note audio voltmeter reading. d. Close EIA-MIL-STD-188C polarity switch. e. Note audio voltmeter reading. f. Open EIA-MIL-STD-188C polarity switch.	0 ±5 dB mW. Step c reading ±5 dB mW.	} Check U18, U17 and associated circuits.
3. Serial data command with status request	a. Set local unit front-panel CONT switch to REM. b. Set control unit ADDRESS to 0. Note Local unit is strapped for address 0 recognition. c. Set control unit front-panel controls as follows: FREQUENCY KHZ to 29999.9 (0). MODE to ISB. CH A1 to ON (receiver only) RF GAIN to full ccw (receiver only) CH A1 AGC to DATA and AGC BUS to ON (receiver only) CHANNEL ENABLE A1 to LINE (exciter only) KEY to NORM (exciter only) PA PWR to STBY (exciter only) PILOT CARR to OFF (exciter only) PEAK CLIP to OFF (exciter only) CONT to NORM. d. Set control unit ADDRESS to 1. e. Change any and all of controls in step c. f. Note response signals on the control unit as follows:		
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	EQUIPMENT STATUS indicators BANDWIDTH indicators (receiver only). FREQUENCY KHZ indicators. g. Set control unit ADDRESS to 0. h. Note response signals on the control unit as follows: EQUIPMENT STATUS indicators. FREQUENCY KHZ indicators. Note Do not connect ground lead to J1-30 until frequency indication is normal (29999.9). i. Connect a storage oscilloscope to TP6 (blue). Sweep time = 10 ms. Trigger = TRIGGER. Vert scale = 1 V per division. Horiz sweep = Normal. Display = STORE. j. Connect a jumper from J1-30 to ground. k. On control unit, change any FREQUENCY KHZ control (thumbwheel control only).	No change in indications. No change in indications. No change in indications. No fault indications, MODE indicates A1 ISB (exciter and receiver). Indicates 29999.9 (0) kHz. R/E FAULT indicator flashes at 0.5-Hz rate (2 s on, 2 s off). Note Flashing starts approximately 7 seconds after ground connected to J1-30. Oscilloscope display should look similar to command word with status request word 1 (refer to figure 10). Each frequency change changes data pattern.	Check U14, and associated address circuits. Check U7, U9, U10, U11, U1, U2, U3, U4, and associated circuits. Check U1 thru U4, U7, U24, U9, U29, U30, and associated circuits.

(Cont)

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	l. Erase scope and repeat step k as often as necessary to obtain a good result. Note 10-MHz and 1-MHz frequency controls change bit pattern of word 1, character 2. 100-kHz and 10-kHz frequency controls change bit pattern of word 1, character 3. 1-kHz and 100-Hz frequency controls change bit pattern of word 1, character 4. 10-Hz and 1-Hz frequency controls (if applicable) change bit pattern of word 1, character 5. m. Erase scope. On control unit, change RF GAIN control position. n. Erase scope and repeat step m as necessary to obtain a good result. Note RF GAIN control changes bit pattern of word 2, character 2. A1 AGC switch changes bit pattern of word 2, character 4. VBFO enable switch (if applicable) changes bit pattern of word 2, character 4. MODE control changes bit pattern of word 2, character 5.	Note Without special equipment it is impossible to note exact waveform. Look at spacing and bits of data. Oscilloscope display should look similar to command word with status request, word 2 (refer to figure 10). Each RF GAIN control changes data pattern. Refer to note of step k.	Same as step k.
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	o. Erase scope. On control unit, change PA PWR control position. p. Erase scope and repeat step o as often as necessary to obtain a good result. Note VBFO 1-kHz and sign controls (if applicable) change bit pattern of word 3, character 2. VBFO 100-Hz and 10-Hz controls (if applicable) change bit pattern of word 3, character 3. PA PWR control changes bit pattern of word 3, character 5. P CAR switch changes bit pattern of word 3, character 5. q. Erase scope. On control unit, change KEY control position. r. Erase scope and repeat step q as often as necessary to obtain a good result. s. Erase scope. On control unit (with continuous tuning control) set DIAL switch to FINE and rotate TUNING knob.	Oscilloscope display should look similar to command word with status request word 3 (refer to figure 10). Each PA PWR control change changes data pattern. Refer to note of step k. Oscilloscope display should look similar to command word with status request word 4. (Refer to figure 10.) Each application or removal of a key changes data pattern. Refer to note of step k. Oscilloscope display should look similar to command word with status request word 4. (Refer to figure 10.) Each change of TUNING knob rotation speed changes data pattern. Refer to note of step k.	Same as step k. Same as step k. Same as step k.
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	t. Erase scope and repeat steps as often as necessary to obtain a good result. u. Remove jumper from J1-30 to ground.		
4. Serial data status only	a. Repeat steps 3.a. through 3.i. b. Set local unit front-panel controls as follows: FREQUENCY KHZ to 29999.9 (0). MODE to ISB. RF GAIN to full ccw (receiver only). CH A1 AGC to DATA (receiver only). CH A1 AGC BUS to ON (receiver only). CHANNEL ENABLE A1 to LINE (exciter only). KEY to NORM (exciter only). PA PWR to STBY (exciter only). PILOT CARR to OFF (exciter only). CONT to LCL. c. Change any or all of the above front-panel controls on the control unit. d. Note response signals on the control unit. e. Set control unit ADDRESS to 0. f. Note response signals on the control unit as follows: EQUIPMENT STATUS indicators. ISB indicators (receiver only). FREQUENCY KHZ indicators.	No changes. No fault indications, mode indicates ISB (exciter and receiver). BUSY indicator is lit. Indicate A1. Indicates 29999.9 (0) kHz.	Same as test 3.
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. (Cont)	g. Connect a storage oscilloscope to TP6 (blue). Sweep time = 20 ms. Trigger = INTERNAL. Vert scale = 1 V per division. Horiz sweep = SINGLE SWEEP. Display = STORE. h. Note oscilloscope waveform. i. Repeat steps g and h as often as necessary to obtain a good result.	Should look similar to status request only words (refer to figure 10). Note Without special equipment it will be impossible to note exact waveform. Look at spacing and bits of data.	
5. Serial data status only	a. Repeat steps 3.a through 3.i. b. Set local unit front-panel controls as follows: FREQUENCY KHZ to 29999.9 (0). MODE to ISB. RF GAIN to full ccw (receiver only). CH A1 AGC to DATA (receiver only). CH A1 AGC BUS to ON (receiver only). CHANNEL ENABLE A1 to LINE (exciter only). KEY to NORM (exciter only). PA PWR to STBY (exciter only). PILOT CARR to OFF (exciter only). CONT to LCL. c. Change any or all of the above front-panel controls on the control unit.		Same as test 3.
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	d. Note response signals on the control unit. e. Set control unit ADDRESS to 0. f. Note response signals on the control unit as follows: EQUIPMENT STATUS indicators. ISB indicators. FREQUENCY KHZ indicators. g. Connect a storage oscilloscope to TP5 (green). Sweep time = 20 ms. Trigger = INTERNAL. Vert scale = 1 V per division. Horiz sweep = SINGLE SWEEP. Display = STORE. h. Note oscilloscope waveform. i. Repeat steps g and h as often as necessary to obtain a good result.	No changes. No fault indications mode indicates ISB (exciter and receiver). BUSY indicator is lit. Indicate A1. Indicates 29999.9 (0) kHz. Should look similar to monitor word(s)/command word(s) with no status request, (refer to figure 10). Note Without special equipment it will be impossible to note exact waveform. Look at spacing and bits of data.	
6. FSK receiver sensitivity	a. Connect local unit to a control unit through a 40-dB attenuator in both the monitor and data lines. b. Repeat test 3.	Results should be same as test 3 results.	Check U34A and associated circuits.

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. Address recognition	a. Set local unit CONT switch to REM. b. Set control unit ADDRESS to 0. c. Set control unit front-panel controls as follows: FREQUENCY KHZ to 29999.9(9). MODE to ISB. RF GAIN to full ccw (receiver only). CH A1 AGC to DATA (receiver only). CH A1 AGC BUS to ON (receiver only). CHANNEL ENABLE A1 to LINE (exciter only). KEY to NORM (exciter only). PA PWR to STBY (exciter only). PILOT CARR to OFF (exciter only). d. Note response signals on the control unit as follows: EQUIPMENT STATUS indicators. ISB indicators. FREQUENCY KHZ indicators. e. Set control unit ADDRESS to 1. f. Note response signals on the control unit as follows: EQUIPMENT STATUS indicators. ISB indicators.	No fault indications mode indicates ISB. PA READY might be lit (exciter only). Indicates A1. Indicates 29999.9 (9) kHz. EXCTR FAULT, RCV FAULT, or R/E FAULT indicator flashes at a 0.25-Hz rate (on 2 seconds, off 2 seconds). All other indications should remain the same. No change from step d.	Check U1 thru U4, U7, U6, U8, U9, U20, U21, U11, U12, and associated circuits. Check U1, U2, U3, U4, U5, U27, U28, U29, U30, U8, and associated circuits. Check also busy circuit on parallel output.
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

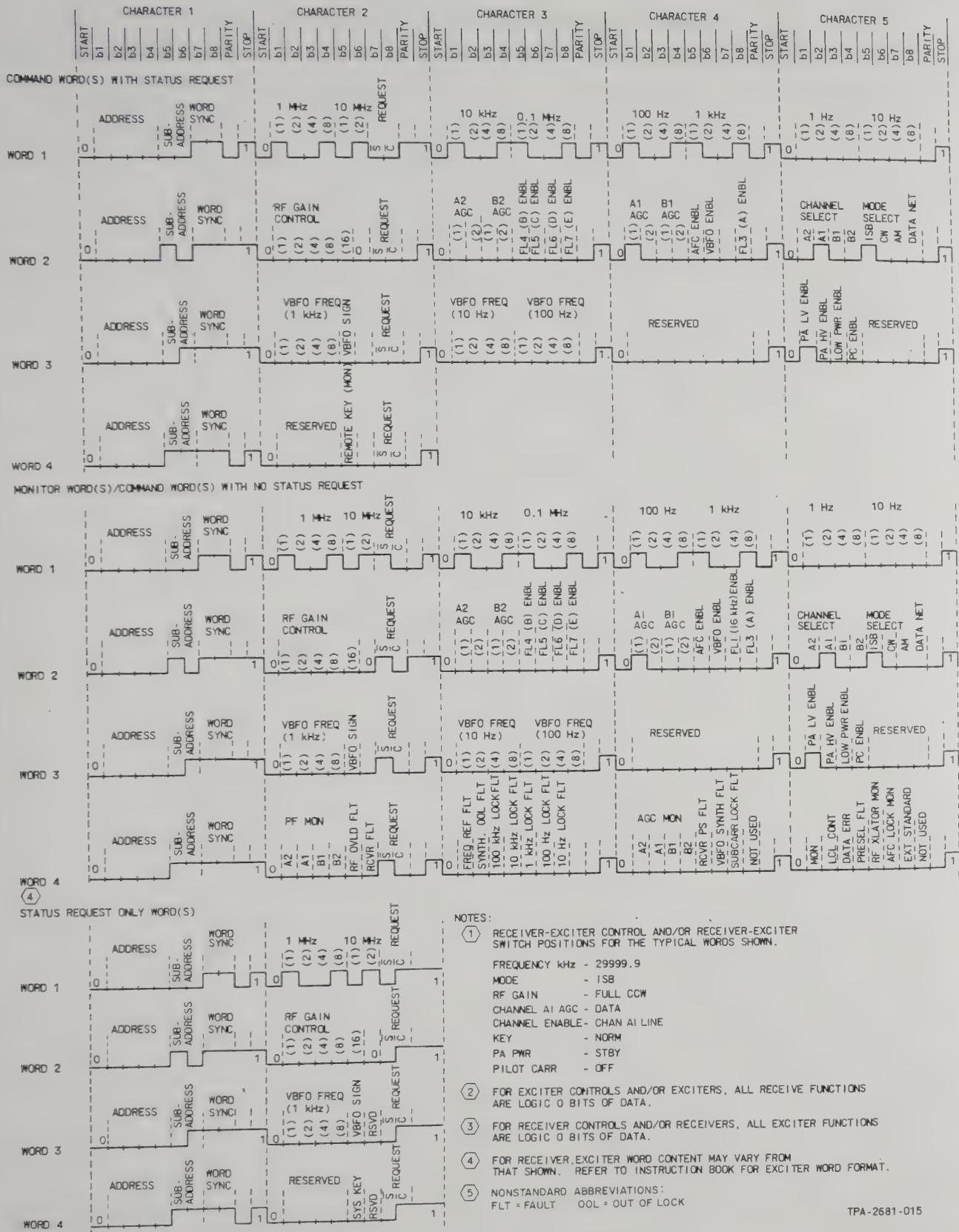
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)	FREQUENCY KHZ indicators. g. Note response signals on the control unit with the ADDRESS to each position 2 through 15.	No change from step d. Same as step f.	Check U1, U2, U3, U4, U5, U27, U28, U29, U30, U8, and associated circuits. Check also busy circuit on parallel output.
8. Word 4 continuous transmit	a. Set control unit ADDRESS to 0. b. Set control unit CONT switch to NORM. c. Connect oscilloscope to TP6 (blue). Sweep time = 20 ms. Trigger = INTERNAL. Vert scale = 1 V per division. Horiz sweep = NORMAL d. Apply a ground to J1-30. e. Remove J1-30 ground.	Continuous data monitored on oscilloscope should look similar to status request only word, word 4. Continuous data on oscilloscope is terminated.	Check U1 thru U4, U7, U23, U24 and associated circuits. Same as step c.
9. Data loop back	a. Set control unit address to 0. b. Disconnect control unit from local unit. c. Set control unit CONT switch to TEST. d. Connect a dual-trace storage oscilloscope with upper trace to TP6 (blue) and lower trace to TP5 (green). e. Set oscilloscope as follows: Sweep time = 20 ms. Trigger = INTERNAL. Vert scale = 1 V per division. Horiz sweep = NORMAL. f. Set control unit front-panel controls as follows: FREQUENCY KHZ to 29999.0 (9). MODE to ISB. RF GAIN to full ccw (receiver only). CH A1 AGC to DATA (receiver only). CH A1 AGC BUS to ON (receiver only). CHANNEL ENABLE A1 to LINE (exciter only).		
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9. (Cont)	KEY to NORM (exciter only). PA PWR to STBY (exciter only). PILOT CARR to OFF (exciter only). g. Set oscilloscope display to STORE. h. Erase display. Set FREQUENCY KHZ to 29999.9(9). i. Erase display. Set MODE control to AM. j. Erase display. Set PA PWR to HIGH PWR. k. Erase display. Set KEY control to LOCK. l. Set control unit CONT switch to NORM. m. Repeat steps g through j.	Both oscilloscope traces are identical and look similar to command word with status request, word 1. (Refer to figure 10.) Both oscilloscope traces are identical and look similar to command word with status request, word 2. (Refer to figure 10.) Both oscilloscope traces are identical and look similar to command word with status request, word 3. (Refer to figure 10.) Both oscilloscope traces are identical and look similar to command word with status request, word 4. (Refer to figure 10.) Upper trace same as steps g through j. Lower trace, straight line.	Check U1 through U4 and associated circuits. Same as step h. Same as step h. Same as step h. Same as step h.
10. Baud rate check	a. Note baud rate strapped in unit. b. Strap baud rate for 75. c. Repeat test 10.	Reference. Same as test 10 except monitor word spacing increases as baud rate decreases and vice versa.	Same as test 10.
(Cont)			

Table 2. Serial Interface, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10. (Cont)	d. Strap baud rate for 19 200. e. Repeat test 10. f. Return to baud rate strapping referenced in step a.		



Timing Diagram/Typical Waveforms
Figure 10

4. ALIGNMENT/ADJUSTMENT

4.1 Control Data Strapping

For strapping instructions and information, refer to paragraph 2.5 of this instruction.

4.2 Adjustment of FSK Detector Symmetry

- Perform test setup of table 2, test 1.
- Strap card for FSK signaling (refer to paragraph 2.5.1).
- Strap card for 1200 bauds (refer to paragraph 2.5.6).
- Strap for odd parity (refer to paragraph 2.5.4).
- Apply a 0-dB mW FSK signal with a symmetrical 1:1 (mark, space) data pattern between P1-54 and P1-55.
- Using an oscilloscope, monitor the waveform at TP5 (green) to ground (TP1, brown).
- Adjust R67 to obtain best symmetry of the waveform at TP5.

5. REPAIR

Repair of the serial interface card is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

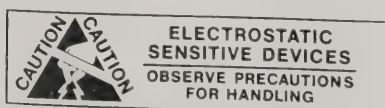
6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 11). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

MFR MANUFACTURER'S NAME
CODE AND ADDRESS

00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75222
02735	RCA CORP SOLID STATE DIVISION ROUTE 2C2 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
07388	TOROTEL INC 13402 S 71 HIGHWAY GRANDVIEW MO 64030
12040	NATIONAL SEMICONDUCTOR CORP COMMERCE DR P O BOX 443 DANBURY CT 06810
12954	SIEMENS CORP COMPONENTS GROUP 8700 E THOMAS RD P O BOX 1390 SCOTTSDALE AZ 85252
15818	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
18324	SIGNETICS CORP 811 E ARQUES SUNNYVALE CA 94086
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
27264	MOLEX INC CORPORATE HQ 2222 WELLINGTON COURT LISLE IL 60532
27735	F-DYNE ELECTRONICS 449 HOWARD AVE BRIDGEPORT CT 06605

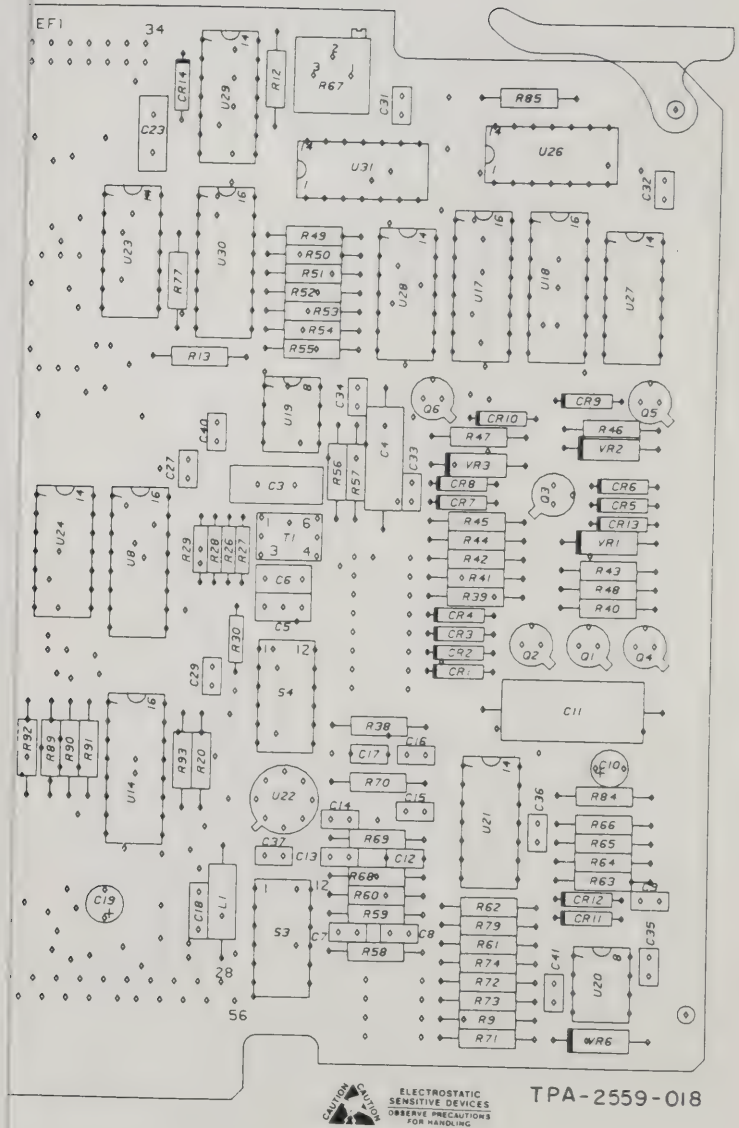
MFR MANUFACTURER'S NAME
CODE AND ADDRESS

56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
72982	ERIE TECHNOLOGICAL PRODUCTS INC 644 W 12TH ST ERIE PA 16512
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
81349	MILITARY SPECIFICATION
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
96906	MILITARY STANDARD

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Serial Interface	638-6896-001	REV F



Serial Interface, Schematic Diagram
Figure 11 (Sheet 1 of 5)

MFR MANUFACTURER'S NAME
CODE AND ADDRESS

00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75222
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
07388	TOROTEL INC 13402 S 71 HIGHWAY GRANDVIEW MO 64030
12040	NATIONAL SEMICONDUCTOR CORP COMMERCE DR P O BOX 443 DANBURY CT 06810
12954	SIEMENS CORP COMPONENTS GROUP 8700 E THOMAS RD P O BOX 1390 SCOTTSDALE AZ 85252
15818	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
18324	SIGNETICS CORP 811 E ARQUES SUNNYVALE CA 94086
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
27264	MOLEX INC CORPORATE HQ 2222 WELLINGTON COURT LISLE IL 60532
27735	F-DYNE ELECTRONICS 449 HOWARD AVE BRIDGEPORT CT 06605

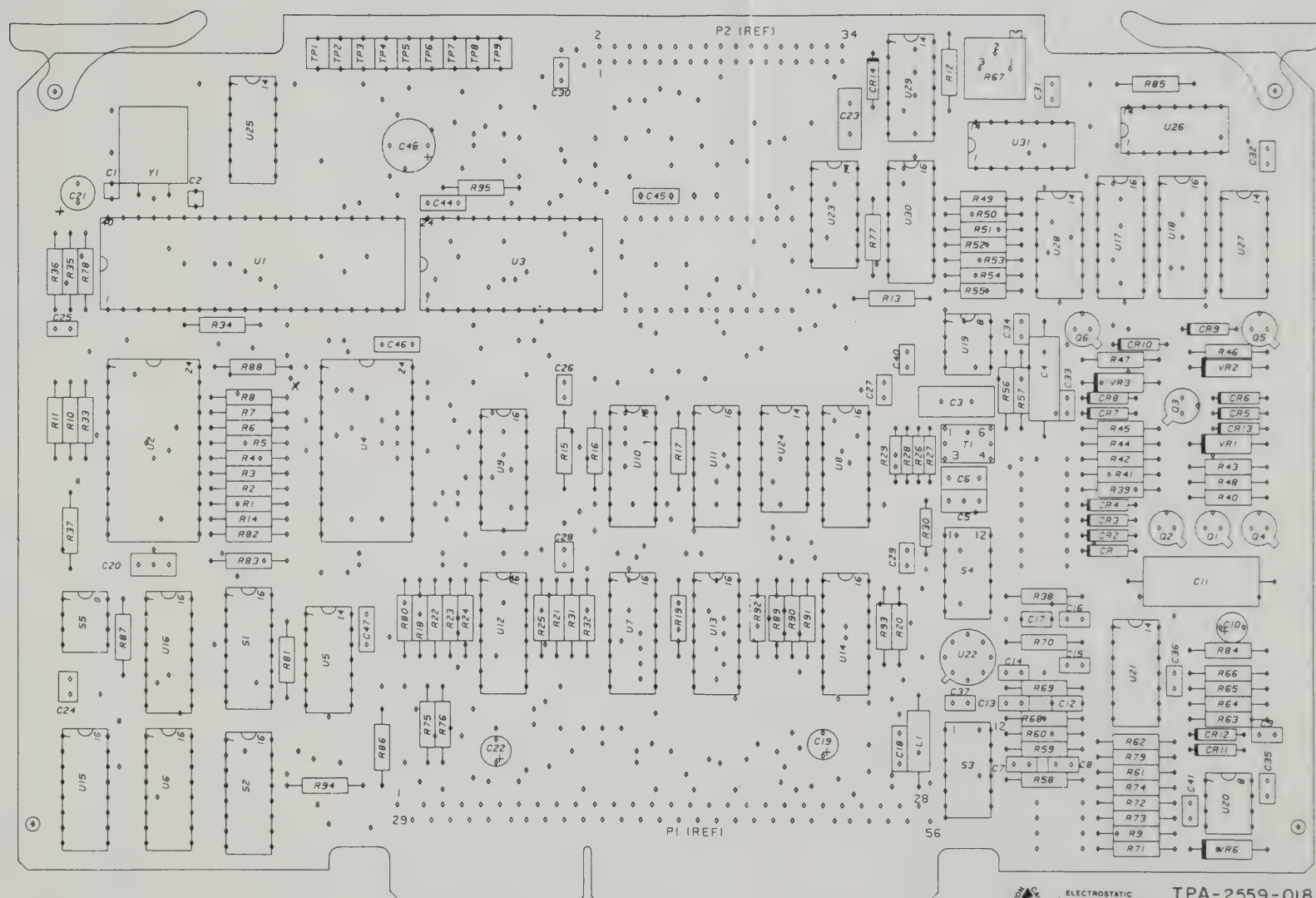
MFR MANUFACTURER'S NAME
CODE AND ADDRESS

56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
72982	ERIE TECHNOLOGICAL PRODUCTS INC 644 W 12TH ST ERIE PA 16512
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
81349	MILITARY SPECIFICATION
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
96906	MILITARY STANDARD

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Serial Interface	638-6896-001	REV F



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2559-018

Serial Interface, Schematic Diagram
Figure 11 (Sheet 1 of 5)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODI
	SERIAL INTERFACE (ESDS)	638-6896-001		
CR1-CR14	SEMICOND DEVICE	353-3644-010		0350
C1,C2	CAPACITOR,FXD CER DIEL, 27PF, 10%, 100V	913-1098-570		7298
C3	CAPACITOR,FXD MICA DIEL, 470PF, 5%, 500V	912-2864-000		7213
C4	CAPACITOR,FXD PLSTC DIEL, 0.0056UF, 10%, 80V	933-1039-320		2773
C5,C6	CAPACITOR,FXD CER DIEL, 1UF, 20%, 50V	913-3279-270		1654
C7-C9	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-680		1654
C10	CAPACITOR,FXD TMTLM ELCTLT, 15UF, 20%, 15V	184-9102-130		5628
C11	CAPACITOR,FXD PLSTC DIEL, 0.047UF, 10%, 200V	933-1039-040		2773
C12	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134
C13	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-660		1654
C14-C16	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654
C17	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134
C18	CAPACITOR,FXD CER DIEL, 0.47UF, PORM10%, 50V	913-5019-520		8134
C19	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		5628
C20	CAPACITOR,FXD CER DIEL, 0.22UF, 20%, 50V	913-3279-220		1654
C21	CAPACITOR,FXD TMTLM ELCTLT, 68UF, 20%, 6V	184-9102-040		5628
C22	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		5628
C23	CAPACITOR,FXD CER DIEL, 1.5UF, 20%, 50V	913-3279-280		1654
C24-C37	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654
C38,C39	NOT USED			
C40,C41	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654
C42,C43	NOT USED			
C44-C47	CAPACITOR,FXD CER DIEL, 0.47UF, PORM10%, 50V	913-5019-520		8134
C48	CAPACITOR,FXD TMTLM ELCTLT, 100UF, 20%, 10V	184-9102-100		5628
L1	COIL,RF 1UH	240-2715-130		9690
Q1	TRANSISTOR	352-0551-010		1581
Q2	TRANSISTOR	352-0661-020		0726
Q3	TRANSISTOR	352-0551-010		1581
Q4	TRANSISTOR	352-0661-020		0726
Q5	TRANSISTOR	352-0551-010		1581
Q6	TRANSISTOR	352-0661-020		0726
R1-R8	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
R9	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R10-R21	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
R22-R25	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R26-R30	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/8W	745-2449-000		8134
R31,R32	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R33-R38	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		8134
R39-R41	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
R42	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/4W	745-0755-000		8134
R43	RESISTOR,FXD CMPSN, 390 OHMS, 10%, 1/4W	745-0734-000		8134
R44,R45	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		8134
R46,R47	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/4W	745-0743-000		8134
R48	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		8134
R49-R52	RESISTOR,FXD FILM, 20.5K, 1%, 1/8W	705-1059-000		8134
R53,R54	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
R55,R56	RESISTOR,FXD FILM, 48.7K, 1%, 1/8W	705-1077-000		8134
R57,R58	RESISTOR,FXD CMPSN, 560 OHMS, 10%, 1/4W	745-0740-000		8134
R59,R60	RESISTOR,FXD CMPSN, 22K, 10%, 1/4W	745-0797-000		8134
R61	RESISTOR,FXD CMPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		8134
R62	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		8134
R63	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		8134
R64	RESISTOR,FXD CMPSN, 15K, 10%, 1/4W	745-0791-000		8134
R65	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
R66	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		8134
R67	RESISTOR,VAR MM, 2K, PORM5%, 3/4W	381-1721-050		8134
R68-R70	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
R71	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		8134
R72	RESISTOR,FXD CMPSN, 0.82MEGO, 10%, 1/4W	745-0854-000		8134
R73	RESISTOR,FXD CMPSN, 0.18MEGO, 10%, 1/4W	745-0830-000		8134
R74	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		8134
R75-R77	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R78	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		8134
R79	RESISTOR,FXD CMPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		8134
R80	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R81,R82	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
R83	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R84	RESISTOR,FXD CMPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		8134
R85	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		8134
R86,R87	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		8134
R88	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
R89-R94	RESISTOR,FXD CMPSN, 0.39MEGO, 10%, 1/4W	745-0842-000		8134
R95	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		8134
S1,S2	SWITCH,DUAL PKG	266-0243-050		2726
S3,S4	SWITCH,DUAL PKG	266-0243-030		2726
S5	SWITCH,DUAL PKG	266-0243-010		2726
TP1	JACK,TIP BRN	360-0484-070		7497
TP2	JACK,TIP RED	360-0484-020		7497
TP3	JACK,TIP ORN	360-0484-050		7497
TP4	JACK,TIP YEL	360-0484-060		7497
TP5	JACK,TIP GRN	360-0484-040		7497
TP6	JACK,TIP BLU	360-0484-080		7497
TP7	JACK,TIP VIO	360-0484-090		7497
TP8	JACK,TIP GRA	360-0484-100		7497
TP9	JACK,TIP WHT	360-0484-010		7497
T1	TRANSFORMER, RF	677-0324-320		0738
U1	MICROPROCESSOR (ESDS)	351-8676-010		0471
U2	INTEGRATED CIRCUIT COMM INTFC ADAPTER (ESDS)	351-8455-010		0471
U3	INTEGRATED CIRCUIT EPROM (ESDS)	647-2751-001		

tic Diagram

2)

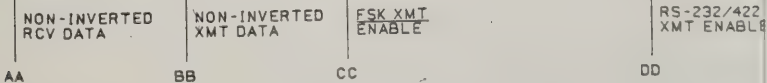
PARTS LIST

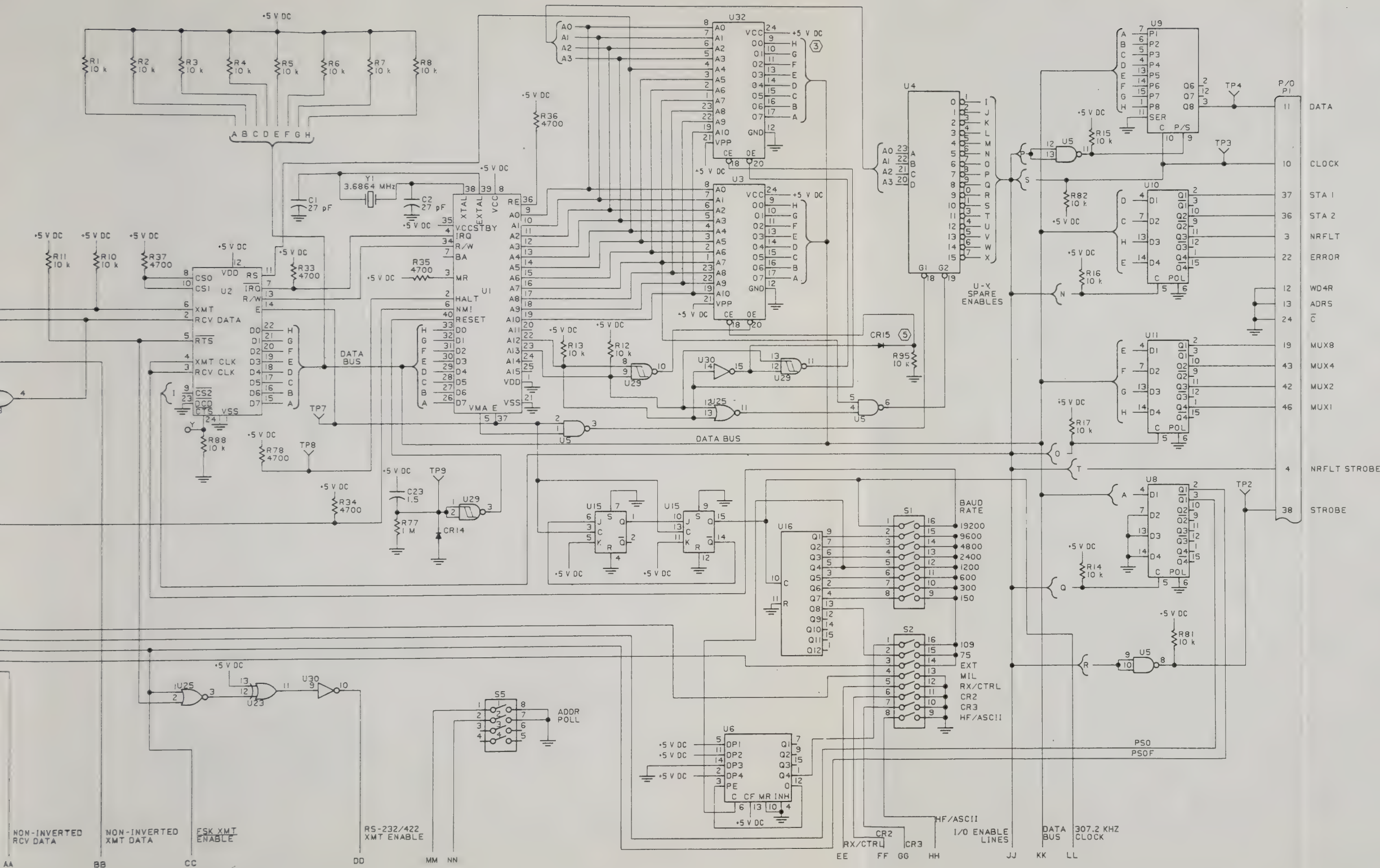
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
CR1-CR14	SERIAL INTERFACE (ESDS)	638-6896-001			
C1,C2	SEMICONV DEVICE	353-3644-010		03508	1N4454GE
	CAPACITOR,FXD CER DIEL, 27PF, 10%, 100V	913-1098-570		72982	8111A100C0G0-270
C3	CAPACITOR,FXD MICA DIEL, 470PF, 5%, 500V	912-2864-000		72136	DM15F471J300MV4C
C4	CAPACITOR,FXD PLSTC DIEL, 0.0056UF, 10%, 80V	933-1039-320		27735	PE1S0056-80-10
C5-C6	CAPACITOR,FXD CER DIEL, 1UF, 20%, 50V	913-3279-270		16546	CY30C105M
C7-C9	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-680		16546	CY20C104M
C10	CAPACITOR,FXD TMTLM ELCTLT, 15UF, 20%, 15V	184-9102-130		56289	199D156X0015CB1
C11	CAPACITOR,FXD PLSTC DIEL, 0.047UF, 10%, 200V	933-1039-040		27735	PE1S047-200-10
C12	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C13	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-680		16546	CY20C104M
C14-C16	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C17	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C18	CAPACITOR,FXD CER DIEL, 0.47UF, PORM10%, 50V	913-5019-520		81349	CK06BX474K
C19	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C20	CAPACITOR,FXD CER DIEL, 0.22UF, 20%, 50V	913-3279-220		16546	CY30C224M
C21	CAPACITOR,FXD TMTLM ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	199D686X0006DB1
C22	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C23	CAPACITOR,FXD CER DIEL, 1.5UF, 20%, 50V	913-3279-280		16546	CY40C155M
C24-C37	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C38,C39	NOT USED				
C40,C41	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C42,C43	NOT USED				
C44-C47	CAPACITOR,FXD CER DIEL, 0.47UF, PORM10%, 50V	913-5019-520		81349	CK06BX474K
C48	CAPACITOR,FXD TMTLM ELCTLT, 100UF, 20%, 10V	240-2715-130		56289	196D235
C1	COIL,RF LHM	240-2715-130		96906	MS75088-1
Q1	TRANSISTOR	352-0551-010		15818	2N2907A
Q2	TRANSISTOR	352-0661-020		07263	2N2222A
Q3	TRANSISTOR	352-0551-010		15818	2N2907A
Q4	TRANSISTOR	352-0661-020		07263	2N2222A
Q5	TRANSISTOR	352-0551-010		15818	2N2907A
Q6	TRANSISTOR	352-0661-020		07263	2N2222A
R1-R8	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R9	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R10-R21	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R22-R25	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R26-R30	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	RCR05G105KS
R31,R32	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R33-R38	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R39-R41	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R42	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS
R43	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR07G391KS
R44,R45	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R46,R47	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR07G681KS
R48	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R49-R52	RESISTOR,FXD FILM, 20.5K, 1%, 1/8W	705-1059-000		81349	RN55D2052F
R53,R54	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R55,R56	RESISTOR,FXD FILM, 48.7K, 1%, 1/8W	705-1077-000		81349	RN55D4872F
R57,R58	RESISTOR,FXD CHPSN, 560 OHMS, 10%, 1/4W	745-0740-000		81349	RCR07G561KS
R59,R60	RESISTOR,FXD CHPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R61	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS
R62	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS
R63	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R64	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR07G153KS
R65	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R66	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R67	RESISTOR,VAR WM, 2K, PORM5%, 3/4W	381-1721-050		81349	RT22C2P202
R68-R70	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R71	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R72	RESISTOR,FXD CHPSN, 0.82MEGO, 10%, 1/4W	745-0854-000		81349	RCR07G824KS
R73	RESISTOR,FXD CHPSN, 0.18MEGO, 10%, 1/4W	745-0830-000		81349	RCR07G184KS
R74	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS
R75-R77	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R78	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R79	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS
R80	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R81,R82	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R83	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R84	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS
R85	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS
R86,R87	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R88	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R89-R94	RESISTOR,FXD CHPSN, 0.39MEGO, 10%, 1/4W	745-0842-000		81349	RCR07G394KS
R95	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
S1,S2	SWITCH,DUAL PKG	266-0243-050		27264	A10040-108
S3,S4	SWITCH,DUAL PKG	266-0243-030		27264	A10040-106
S5	SWITCH,DUAL PKG	266-0243-010		27264	A10040-104
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
TP3	JACK,TIP ORN	360-0484-050		74970	105-1106-011
TP4	JACK,TIP YEL	360-0484-060		74970	105-1107-011
TP5	JACK,TIP GRN	360-0484-040		74970	105-1104-011
TP6	JACK,TIP BLU	360-0484-080		74970	105-1110-011
TP7	JACK,TIP VIO	360-0484-090		74970	105-1112-011
TP8	JACK,TIP GRA	360-0484-100		74970	105-1113-011
TP9	JACK,TIP WHT	360-0484-010		74970	105-1101-011
T1	TRANSFORMER, RF	677-0324-320		07388	26077
U1	MICROPROCESSOR (ESDS)	351-8676-010		04713	MC6802P
U2	INTEGRATED CIRCUIT COMM INTFC ADAPTER (ESDS)	351-8455-010		04713	MC6850P
U3	INTEGRATED CIRCUIT EPROM (ESDS)	647-2751-001			2716

PARTS LIST (Cont)

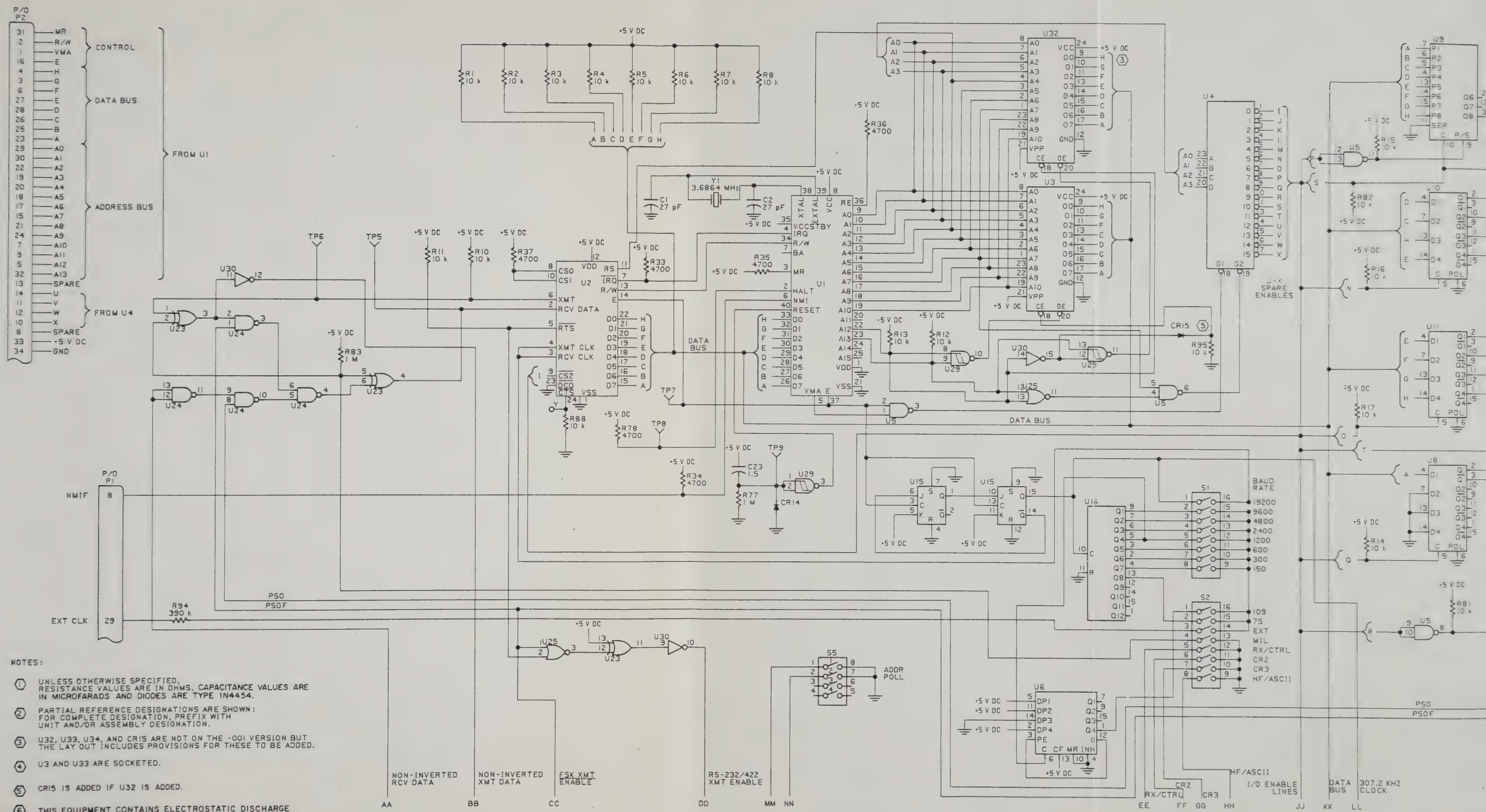
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
U4	INTEGRATED CIRCUIT DECODER	351-1526-090			27014 DM74LS154N
U5	INTEGRATED CIRCUIT LOGIC GATE	351-1523-110			18324 N74LS00N
U6	INTEGRATED CIRCUIT COUNTER (ESDS)	351-8277-010			04713 MC14526BCP
U7	INTEGRATED CIRCUIT (ESDS)	351-8490-010			04713 MC14503BCP
U8	INTEGRATED CIRCUIT (ESDS)	351-8159-160			07263 4042BPC
U9	INTEGRATED CIRCUIT (ESDS)	351-8159-230			07263 4021BPC
U10,U11	INTEGRATED CIRCUIT (ESDS)	351-8159-160			07263 4042BPC
U12-U14	INTEGRATED CIRCUIT (ESDS)	351-8490-010			04713 MC14503BCP
U15	INTEGRATED CIRCUIT (ESDS)	351-8159-180			07263 4027BPC
U16	INTEGRATED CIRCUIT (ESDS)	351-8159-240			07263 4040BPC
U17	INTEGRATED CIRCUIT (ESDS)	351-8315-010			07263 F4520PC
U18	INTEGRATED CIRCUIT (ESDS)	351-8253-010			04713 MC14018BCP
U19	INTEGRATED CIRCUIT OPNL AMPLIFIER	351-1071-070			07263 UA1458TC
U20	INTEGRATED CIRCUIT AMPLIFIER	351-1286-010			07263 UA1558RM
U21	INTEGRATED CIRCUIT	351-1114-010			27014 LM565CN
U22	INTEGRATED CIRCUIT COMPARATOR	351-1094-060			12040 LM311H
U23	INTEGRATED CIRCUIT (ESDS)	351-8407-010			04713 MC14070BCP
U24	INTEGRATED CIRCUIT (ESDS)	351-8159-340			07263 4011BPC
U25,U26	INTEGRATED CIRCUIT (ESDS)	351-8159-320			07263 4001BPC
U27	INTEGRATED CIRCUIT (ESDS)	351-8159-340			07263 4011BPC
U28	INTEGRATED CIRCUIT (ESDS)	351-8407-010			04713 MC14070BCP
U29	INTEGRATED CIRCUIT (ESDS)	351-8342-010			02735 CD4093BE
U30	INTEGRATED CIRCUIT (ESDS)	351-8159-210			07263 F4049BPC
U31	INTEGRATED CIRCUIT (ESDS)	351-8159-320			07263 4001BPC
VR1	SEMICONV DEVICE	353-2938-000			01295 1N746A
VR2,VR3	SEMICONV DEVICE	353-2712-000			12954 1N752A
VR4,VR5	NOT USED				
VR6	SEMICONV DEVICE	353-2708-000			81483 1N750A
Y1	CRYSTAL UNIT,QTZ 3.6864MHZ	289-7120-060			00136 289-7120-060M20

Serial Interface, Schematic Diagram
Figure 11 (Sheet 2)

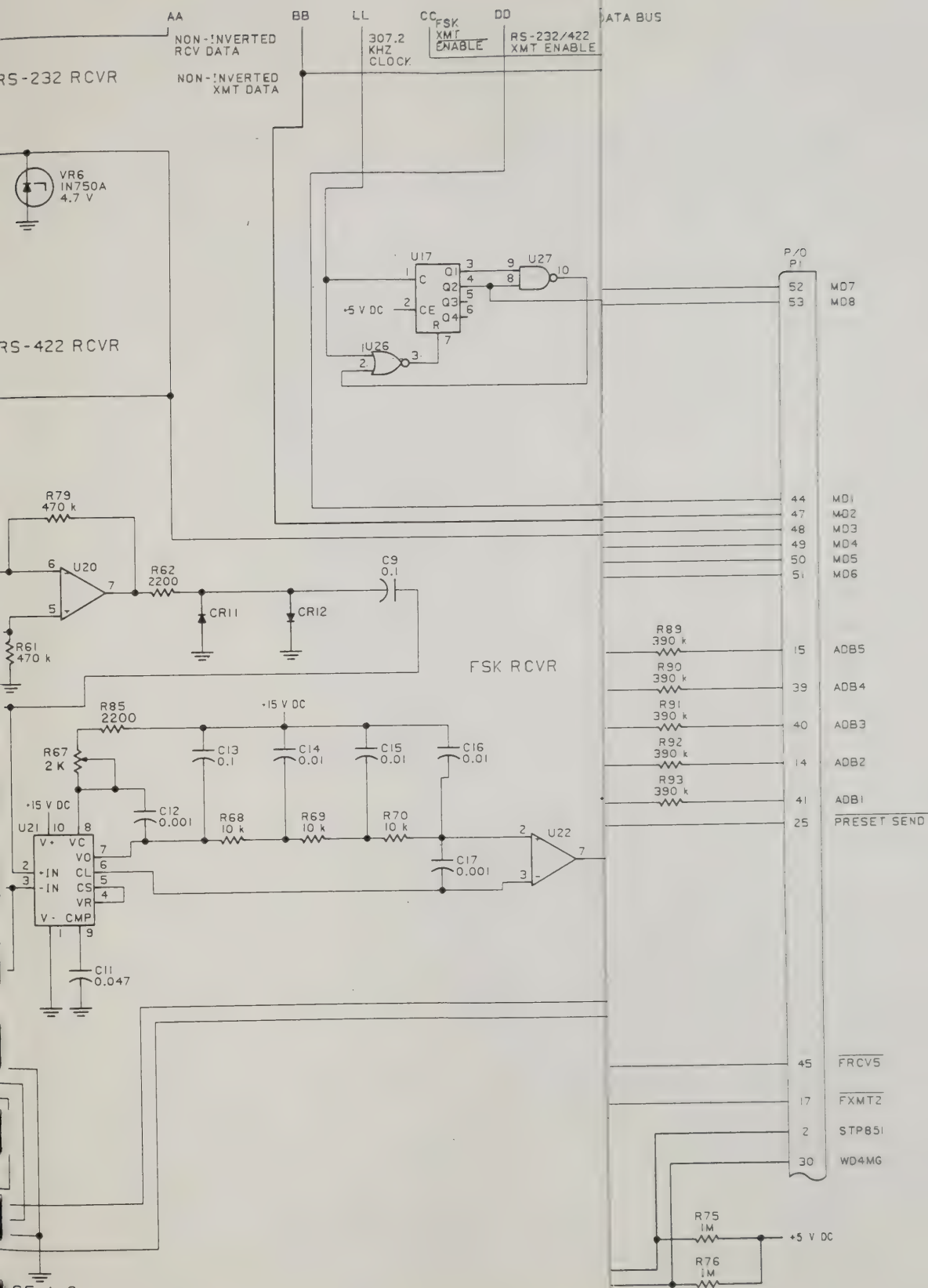




Serial Interface, Schematic Diagram
Figure 11 (Sheet 3)

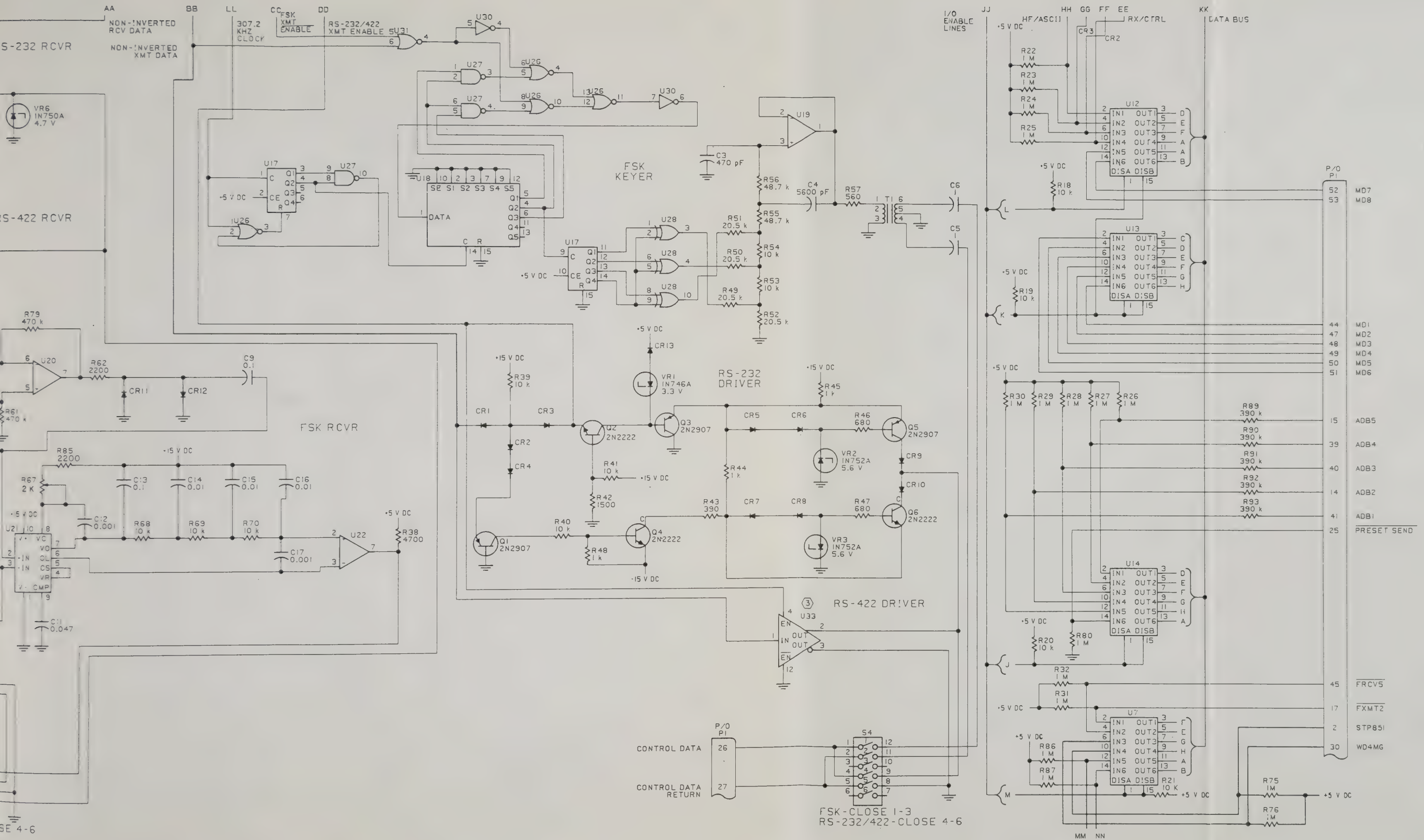


- NOTES:
- 1 UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS AND DIODES ARE TYPE 1N4454.
 - 2 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
 - 3 U32, U33, U34, AND CR15 ARE NOT ON THE -001 VERSION BUT THE LAY OUT INCLUDES PROVISIONS FOR THESE TO BE ADDED.
 - 4 U3 AND U33 ARE SOCKETED.
 - 5 CR15 IS ADDED IF U32 IS ADDED.
 - 6 THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

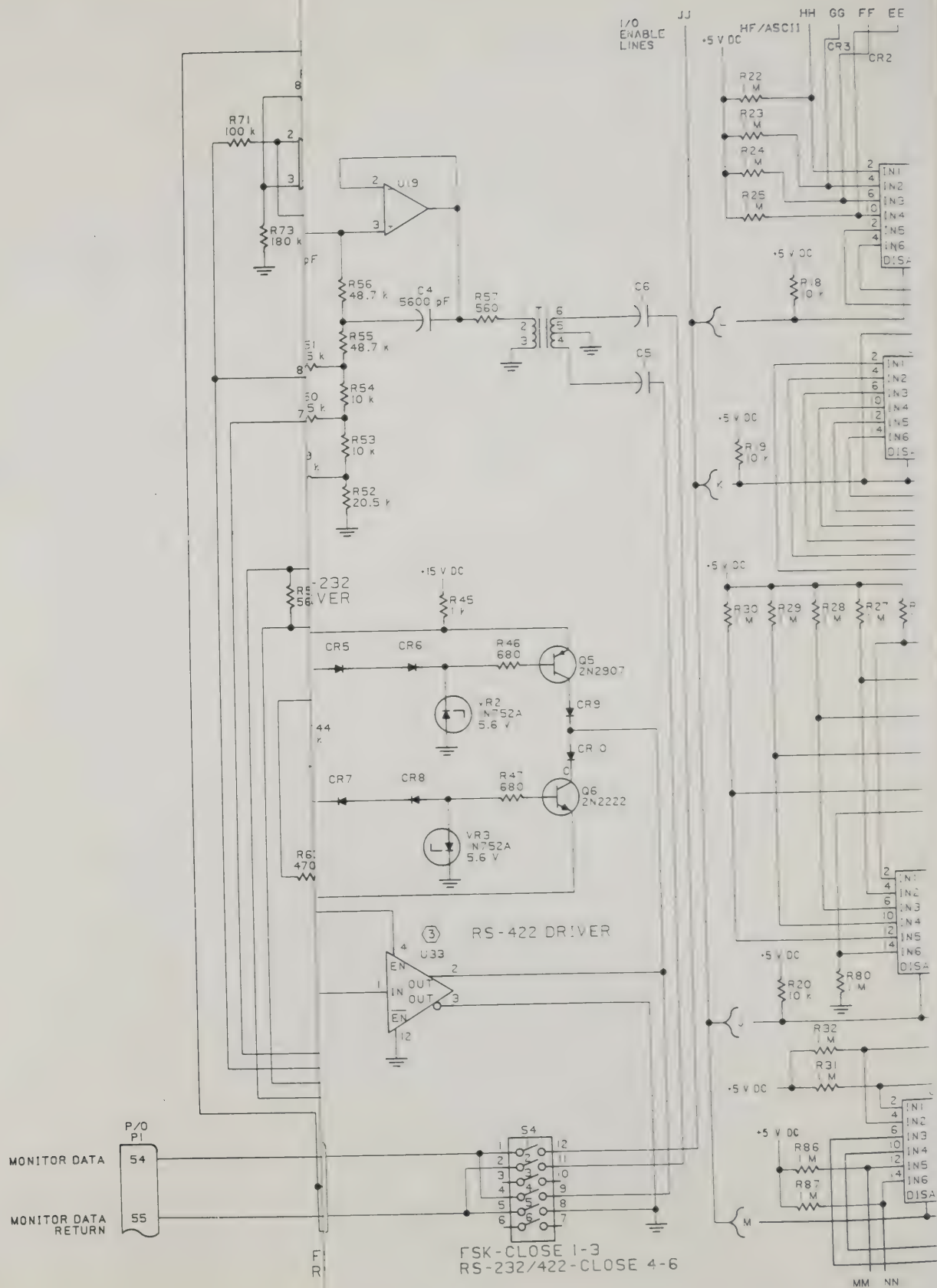


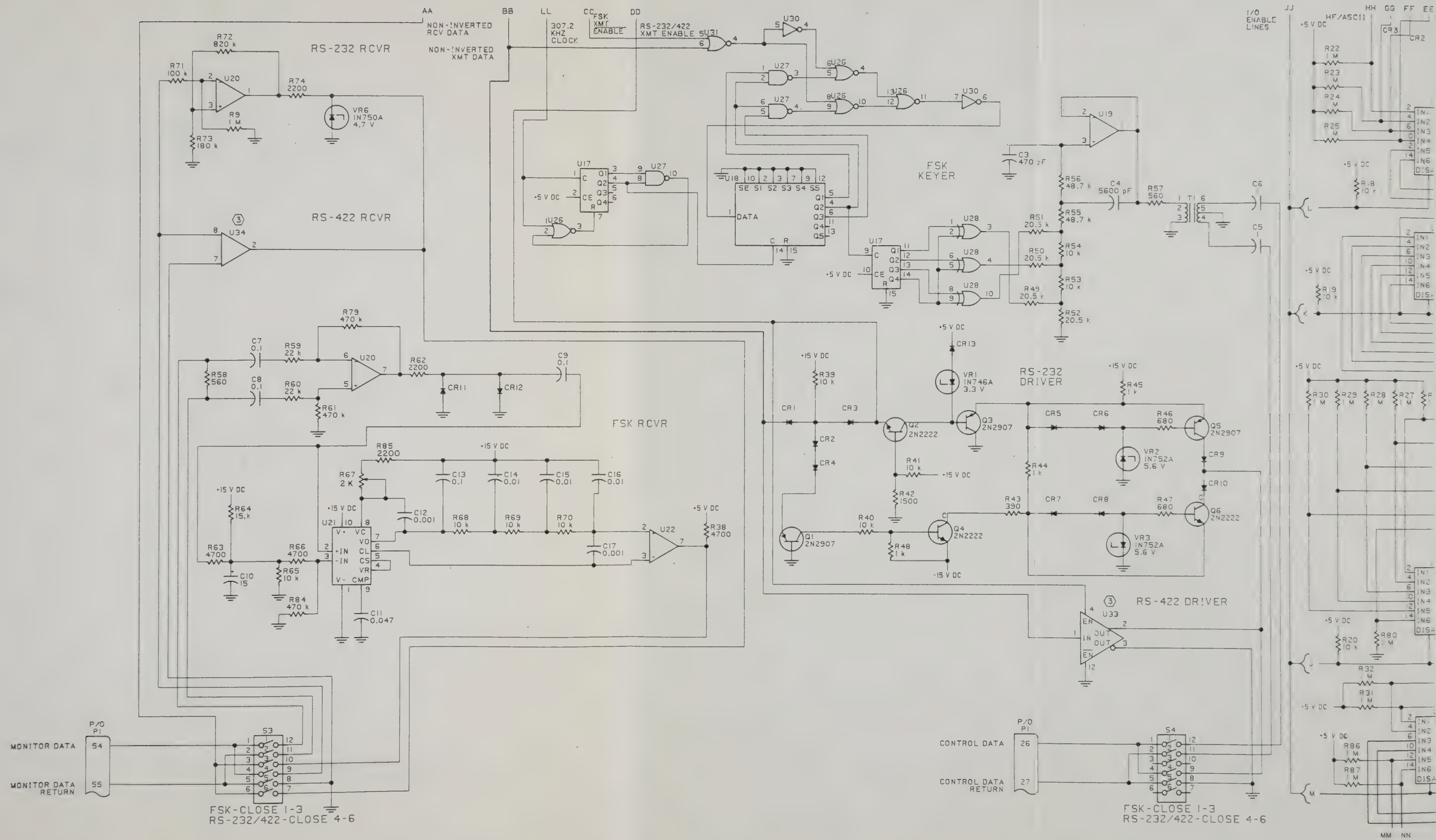
638-6898

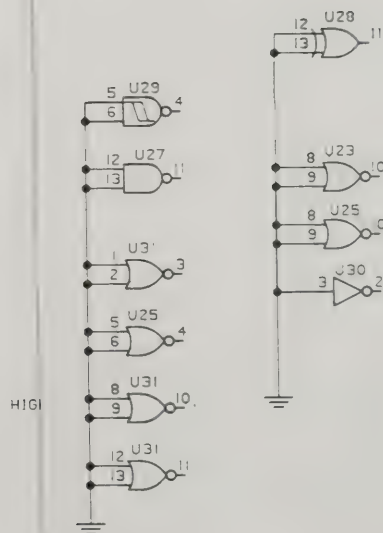
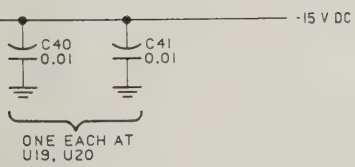
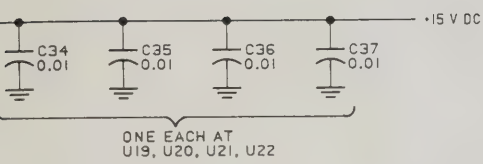
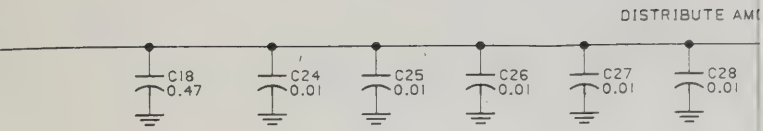
Serial Interface, Schematic Diagram
Figure 11 (Sheet 4)



Serial Interface, Schematic Diagram
Figure 11 (Sheet 4)

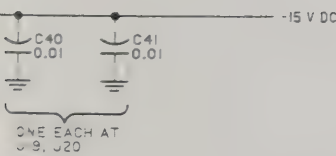
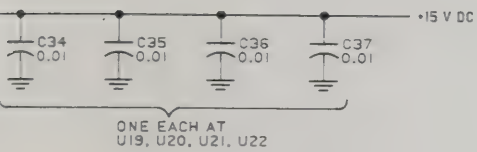
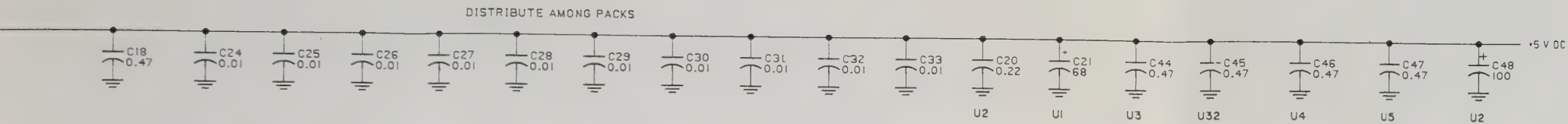






638-6898

Serial Interface, Schematic Diagram
Figure 11 (Sheet 5)

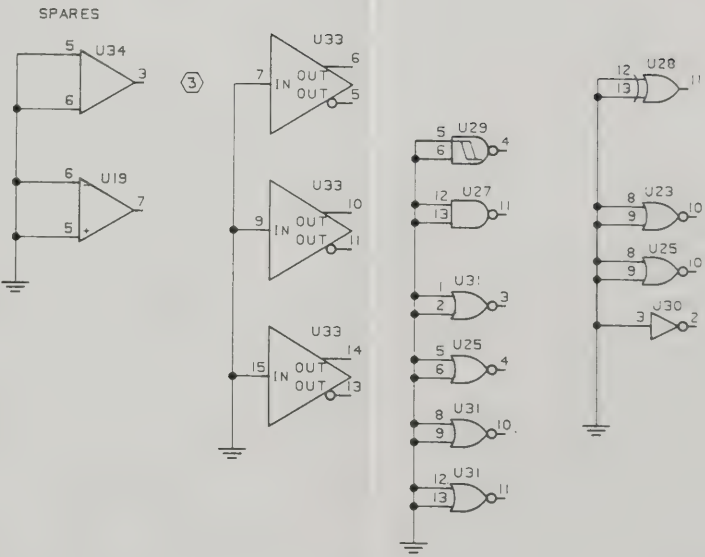


HIGHEST NUMBERS

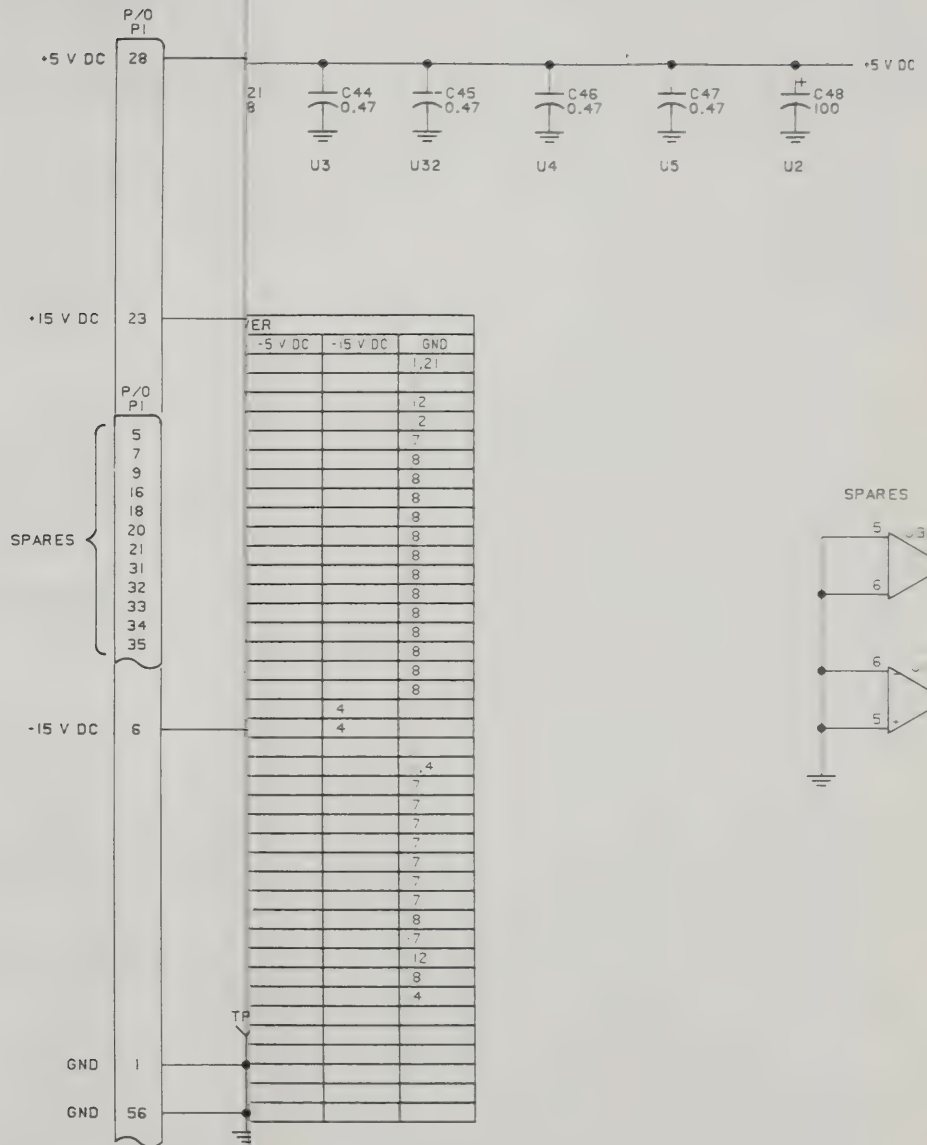
U34
R95
C48
CR15
VR6
LI

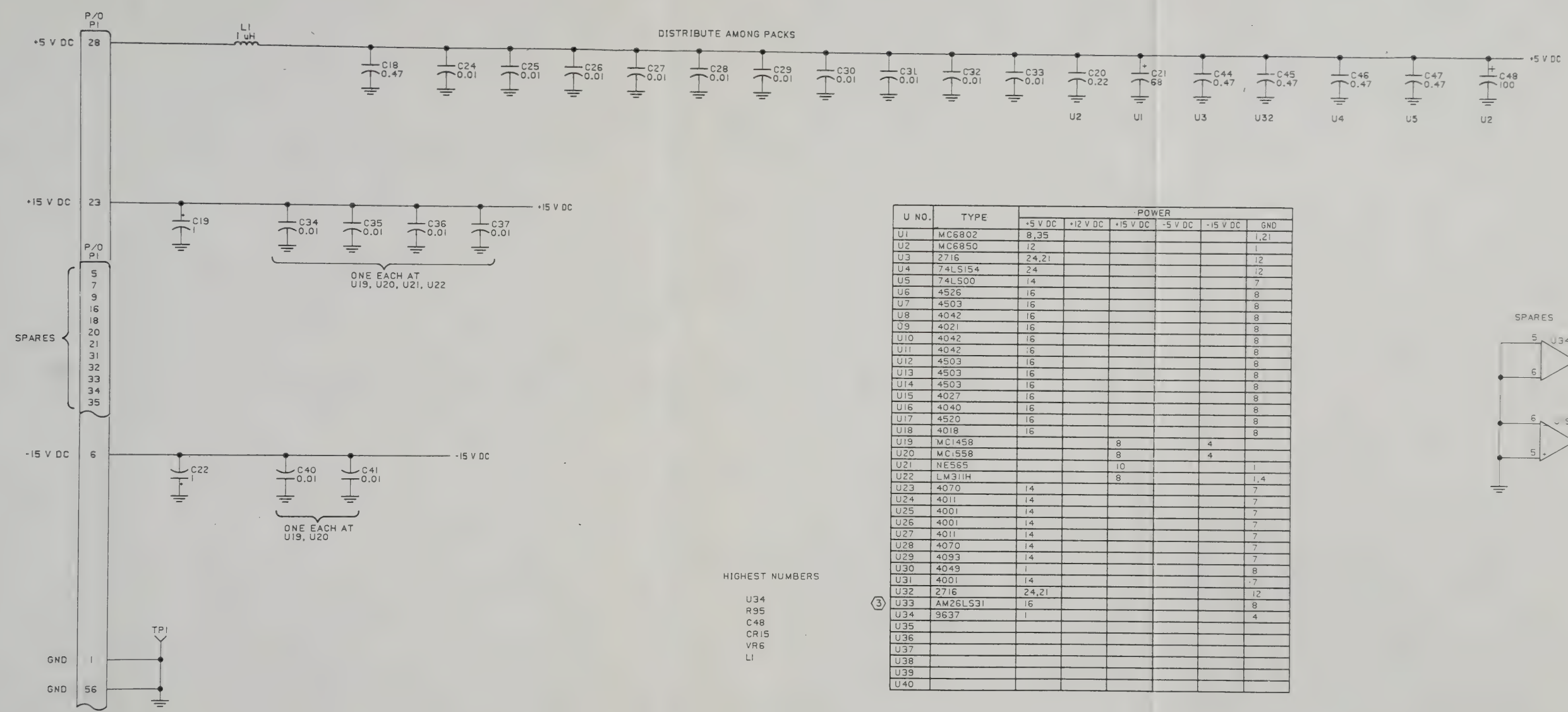
③

U NO.	TYPE	POWER					GND
		+5 V DC	+12 V DC	+15 V DC	-5 V DC	-15 V DC	
U1	MC6802	8,35					1,21
U2	MC6850	12					1
U3	2716	24,21					12
U4	74LS154	24					12
U5	74LS00	14					7
U6	4526	16					8
U7	4503	16					8
U8	4042	16					8
U9	4021	16					8
U10	4042	16					8
U11	4042	16					8
U12	4503	16					8
U13	4503	16					8
U14	4503	16					8
U15	4027	16					8
U16	4040	16					8
U17	4520	16					8
U18	4018	16					8
U19	MC1458			8		4	
U20	MC1558			8		4	
U21	NE565			10			1
U22	LM311H			8			1,4
U23	4070	14					7
U24	4011	14					7
U25	4001	14					7
U26	4001	14					7
U27	4011	14					7
U28	4070	14					7
U29	4093	14					7
U30	4049	1					8
U31	4001	14					7
U32	2716	24,21					12
U33	AM26LS31	16					8
U34	9637	1					4
U35							
U36							
U37							
U38							
U39							
U40							

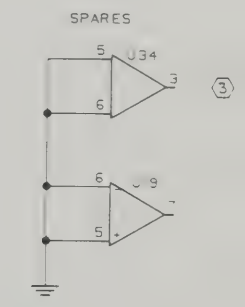


Serial Interface, Schematic Diagram
Figure 11 (Sheet 5)





U NO.	TYPE	POWER					
		+5 V DC	+12 V DC	+15 V DC	-5 V DC	-15 V DC	GND
U1	MC6802	8,35					1,21
U2	MC6850	12					1
U3	2716	24,21					12
U4	74LS154	24					12
U5	74LS00	14					7
U6	4526	16					8
U7	4503	16					8
U8	4042	16					8
U9	4021	16					8
U10	4042	16					8
U11	4042	16					8
U12	4503	16					8
U13	4503	16					8
U14	4503	16					8
U15	4027	16					8
U16	4040	16					8
U17	4520	16					8
U18	4018	16					8
U19	MC1458			8		4	
U20	MC1558			8		4	
U21	NE565			10			1
U22	LM311H			8			1,4
U23	4070	14					7
U24	4011	14					7
U25	4001	14					7
U26	4001	14					7
U27	4011	14					7
U28	4070	14					7
U29	4093	14					7
U30	4049	1					8
U31	4001	14					7
U32	2716	24,21					12
U33	AM26LS31	16					8
U34	9637	1					4
U35							
U36							
U37							
U38							
U39							
U40							





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Synthesizer Voltage Regulator (635-0656-001)

Collins Telecommunications Products Division

523-0767974-003211

3rd Edition, 1 October 1980

Printed in USA

Synthesizer Voltage Regulator
(635-0656-001)

1. DESCRIPTION

Synthesizer Voltage Regulator 635-0656-001, shown in figure 1, is a 2-layer planar card with a 20-pin edge-on connector (2 layers, 10 pins each).

The synthesizer voltage regulator consists of a +20-V dc series regulator, a +5.2-V dc series regulator, and a loss-of-lock summary monitor.

2. PRINCIPLES OF OPERATION

2.1 General

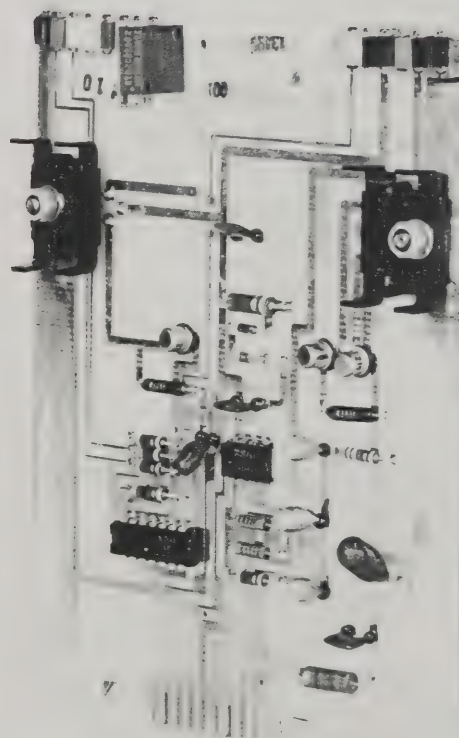
The synthesizer voltage regulator receives +24- and +8-V dc inputs and supplies regulated outputs of +20 and +5.2 V dc.

The synthesizer voltage regulator receives seven monitor inputs and provides one monitor summary output.

2.2 +5.2-V DC Series Regulator (Refer to figure 3.)

The +5.2-V dc series regulator consists of a current/voltage regulator (Q3-Q4), a current control (Q5), a voltage control (U1B), and a reference regulator (VR1).

With +8 and +24 V dc applied, voltage control U1B is enabled. The +24 V dc is applied through R2 to reference regulator VR1. Reference regulator VR1 voltage is applied through R7 to noninverting (reference) input of U1B, and the +5.2-V dc output is applied directly to the inverting input of U1B. Note that R7 is adjusted for an optimum 5.2-V dc regulated output. As the +5.2-V dc output increases, a lower voltage output of U1B is applied to regulator Q3-Q4



TP5-2334-017

Synthesizer Voltage Regulator
Figure 1

base, reducing the output voltage/current of the +5.2-V dc regulator. The inverse is also true.

With +8 V dc applied, current through Q3-Q4 and R6 provides bias for Q5. Q5 supplies an inverted dc output voltage to control Q3-Q4; that is, as the current through R6 increases, the voltage across R6 increases.

NOTICE: This section replaces second edition dated 1 June 1978.

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Increased R6 voltage causes Q5 to increase conduction and decrease voltage at Q3-Q4 base. Conduction of Q3-Q4 is decreased, thus reducing current flow through Q1 and R1. The inverse is also true.

2.3 +20-V DC Series Regulator (Refer to figure 3)

The +20-V dc series regulator consists of current/voltage regulator Q1, current control Q2, and voltage control U1A.

With +24-V dc input applied, and +5.2-V dc regulated output supplied, voltage control U1A is enabled. The +5.2-V dc output is applied to the non-inverting (reference) input of U1A, and the +20-V dc output is supplied through voltage divider R2 and R4 and applied to the inverting input of U1A. As the voltage at the junction of R3-R4 increases, a lower voltage output of U1A is applied to regulator Q1 base, reducing the output voltage/current of the +20-V dc regulator. The inverse is also true.

With the +24 V dc applied, current supplied through Q1 and R1 provides bias for Q2. Q2 supplies an inverted dc output voltage to control Q1; that is, as the current through R1 increases, the voltage across R1 increases. Increased R1 voltage causes Q2 to increase conduction and decrease voltage at Q1 base. Conduction of Q1 is decreased, thus reducing current flow through Q1 and R1. The inverse is also true.

2.4 Loss-of-Lock Monitor (Refer to figure 3.)

The loss-of-lock monitor is a monitor summary circuit that operates as a normal NAND gate. With all

loss-of-lock signals in the normal state (all lock signals present), all logic 1 signals are applied to NAND gate U2 providing a logic 0 output from U2. If any lock signal is lost, a logic 0 is applied by the associated decade to the loss-of-lock monitor and a logic 1 loss-of-lock output is supplied. Note that any (or all) logic 0 inputs to U2 provide a logic 1 output from U2.

2.5 Dual Operational Amplifier 351-1071-070 (Refer to figure 2.)

The 351-1071-070 consists of two operational amplifiers in one package designed for use as summing amplifiers, integrators, or amplifiers with operating characteristics as a function of the external feedback components.

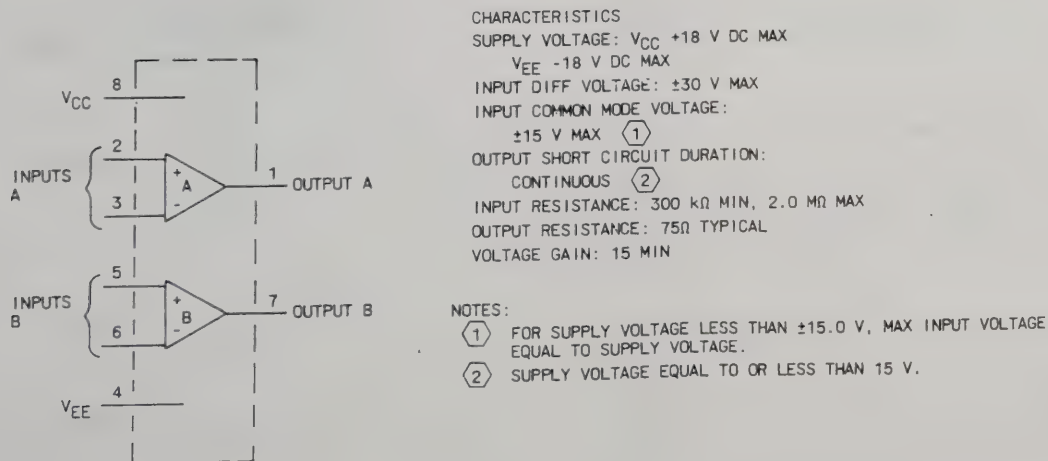
3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the synthesizer voltage regulator are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 1 check total performance of the synthesizer voltage regulator. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.



Dual Operational Amplifier 351-1071-070
 Figure 2

Table 1. Synthesizer Voltage Regulator, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of the unit containing the synthesizer voltage regulator to be tested. b. Remove cover from synthesizer section of unit. c. Remove synthesizer voltage regulator, install it on an extender card, and place it in the unit. d. Set unit LINE SELECTOR switch to 115 V. e. Connect unit to 115-V ac power source and set power on. f. Measure dc voltage from TP10 to TP13 (ground). g. Measure dc voltage from TP11 to TP13 (ground).	+24.0 $\pm$ 0.5 V dc. +8.0 $\pm$ 0.04 V dc.	Check unit power supply. Check unit power supply.
2. +5.2 V dc	a. Measure dc voltage from TP9 to TP13 (ground).	+5.2 $\pm$ 0.05 V dc.	Adjust R7 for +5.2 $\pm$ 0.05 V dc. If R7 adjustment does not correct the problem, check U1B, Q3, Q4, Q5, and associated circuit.
3. +20-V dc regulator	a. Measure dc voltage from TP12 to TP13 (ground).	NLT +19.7 V dc, NMT +20.6 V dc.	Check U1A, Q1, Q2, and associated circuit.
4. Loss-of-lock monitor	a. Measure voltage from TP8 to TP13 (ground). b. Monitor voltage from TP8 to TP13 for steps c thru j. c. Apply a ground signal to TP1. d. Remove ground from TP1 and apply it to TP2. e. Remove ground from TP2 and apply it to TP3. f. Remove ground from TP3 and apply it to TP4. g. Remove ground from TP4 and apply it to TP5.	NMT 0.5 V dc. NLT +3.5 V dc. NLT +3.5 V dc. NLT +3.5 V dc. NLT +3.5 V dc. NLT +3.5 V dc.	Check dc voltages at TP1 thru TP7. If all voltages are NLT +3.5 V dc, check U2 and associated circuit. If any voltages are less than +3.5 V dc, check unit synthesizer card associated with the input. Check U2. Check U2. Check U2. Check U2. Check U2.
(Cont)			

Table 1. Synthesizer Voltage Regulator, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. (Cont)	h. Remove ground from TP4 and apply it to TP6.	NLT +3.5 V dc.	Check U2.
	i. Remove ground from TP6 and apply it to TP7.	NLT +3.5 V dc.	Check U2.
	j. Remove ground from TP7.		
5. Shutdown	a. Set power off. b. Remove synthesizer voltage regulator from card extender and reinstall it in the unit. c. Replace cover on synthesizer section of unit. d. Replace top cover of unit.		

4. ALIGNMENT/ADJUSTMENT

Refer to table 1, test 2 for adjustment of R7 (+5.2-V dc regulator).

5. REPAIR

Repair of the synthesizer voltage regulator is accomplished using the standard planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

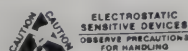
6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 3). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

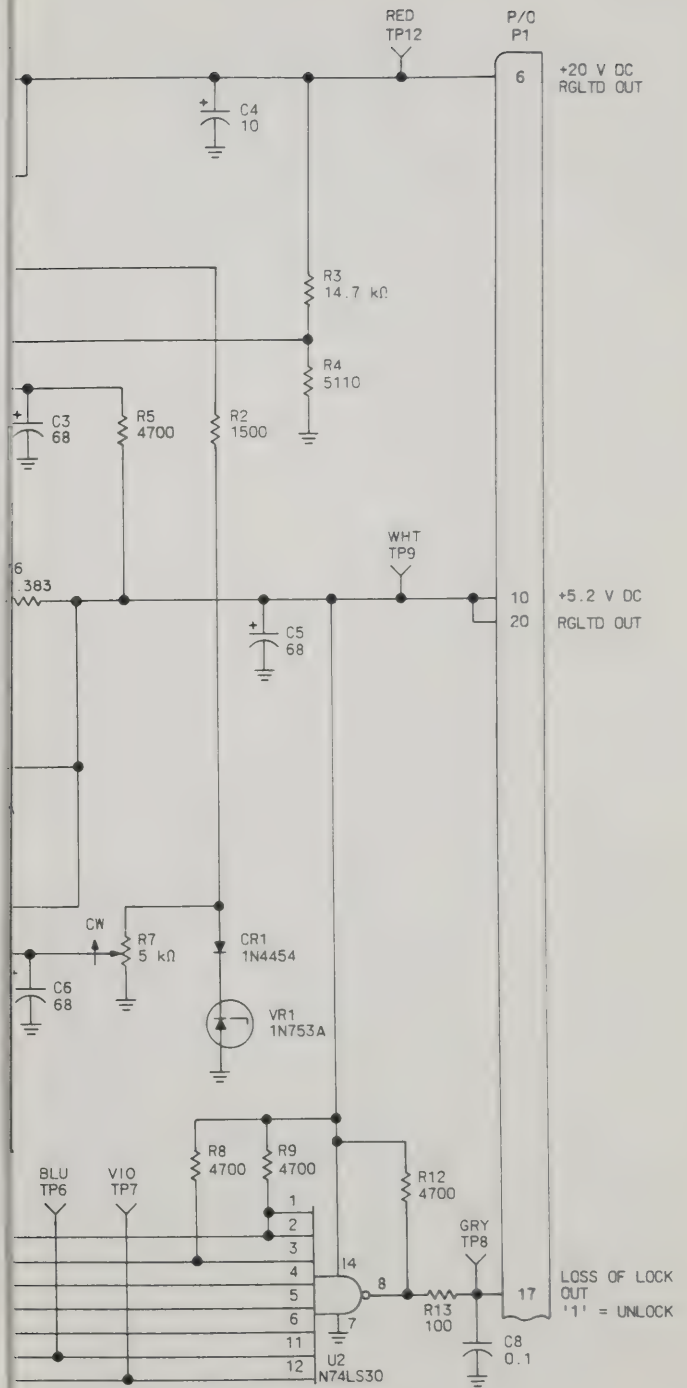
<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
03058	General Electric Co. Semi-Conductor Products Dept. W. Genesee St. Auburn, NY 13021
04713	Motorola, Inc. Semiconductor Products Group 5005 E. McDowell Rd. Phoenix, AZ 85008
07263	Fairchild Camera and Instrument Corp. Semiconductor Div. 464 Ellis St. Mountain View, CA 94042
16545	U.S. Capacitor Corp/Centralab Electronics Div. 4561 Colorado Los Angeles, CA 90039
18324	Signetics Corp. 811 E. Arques Ave. Sunnyvale, CA 94086
56289	Sprague Electric Co. North Adams, MA 01247

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
74970	Johnson, E. F., Co. 299 10th Ave SW Waseca, MN 56093
81349	Military Specifications
81483	International Rectifier PO Box 2321 Terminal Annex 9220 Sunset Blvd. Los Angeles, CA 90069
96906	Military Standards

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Synthesizer voltage regulator	635-0656-001	REV C

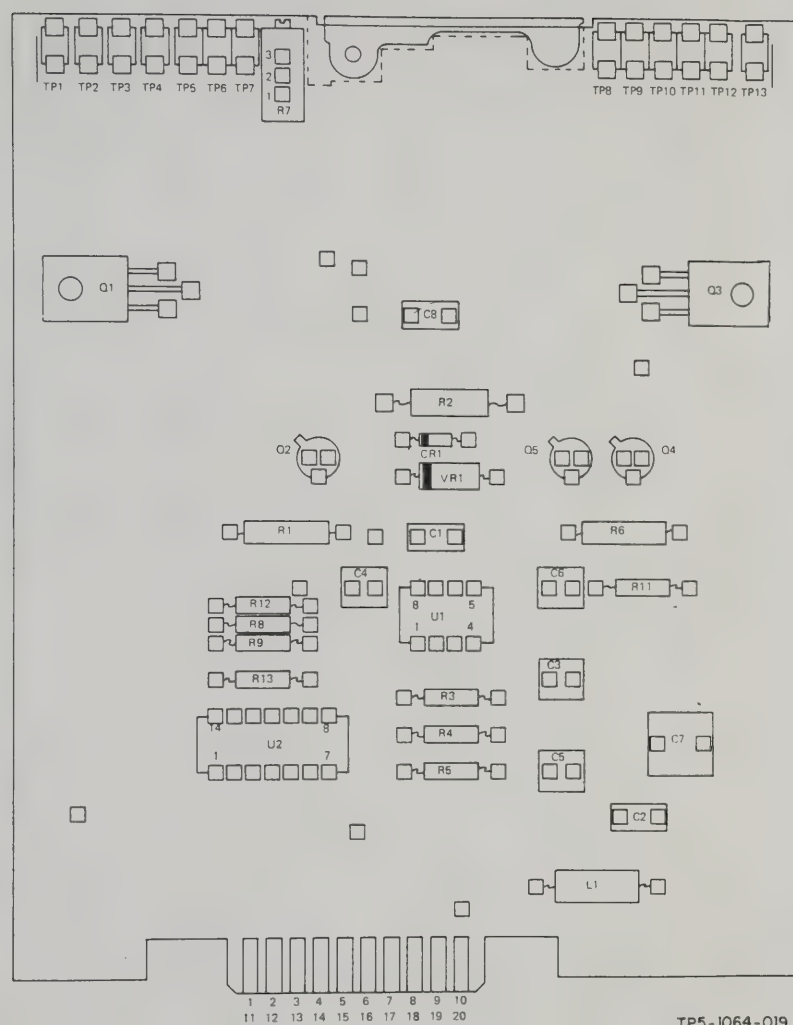


RESISTANCE VALUES ARE IN OHMS
CAPACITANCE VALUES ARE IN MICROFARADS.

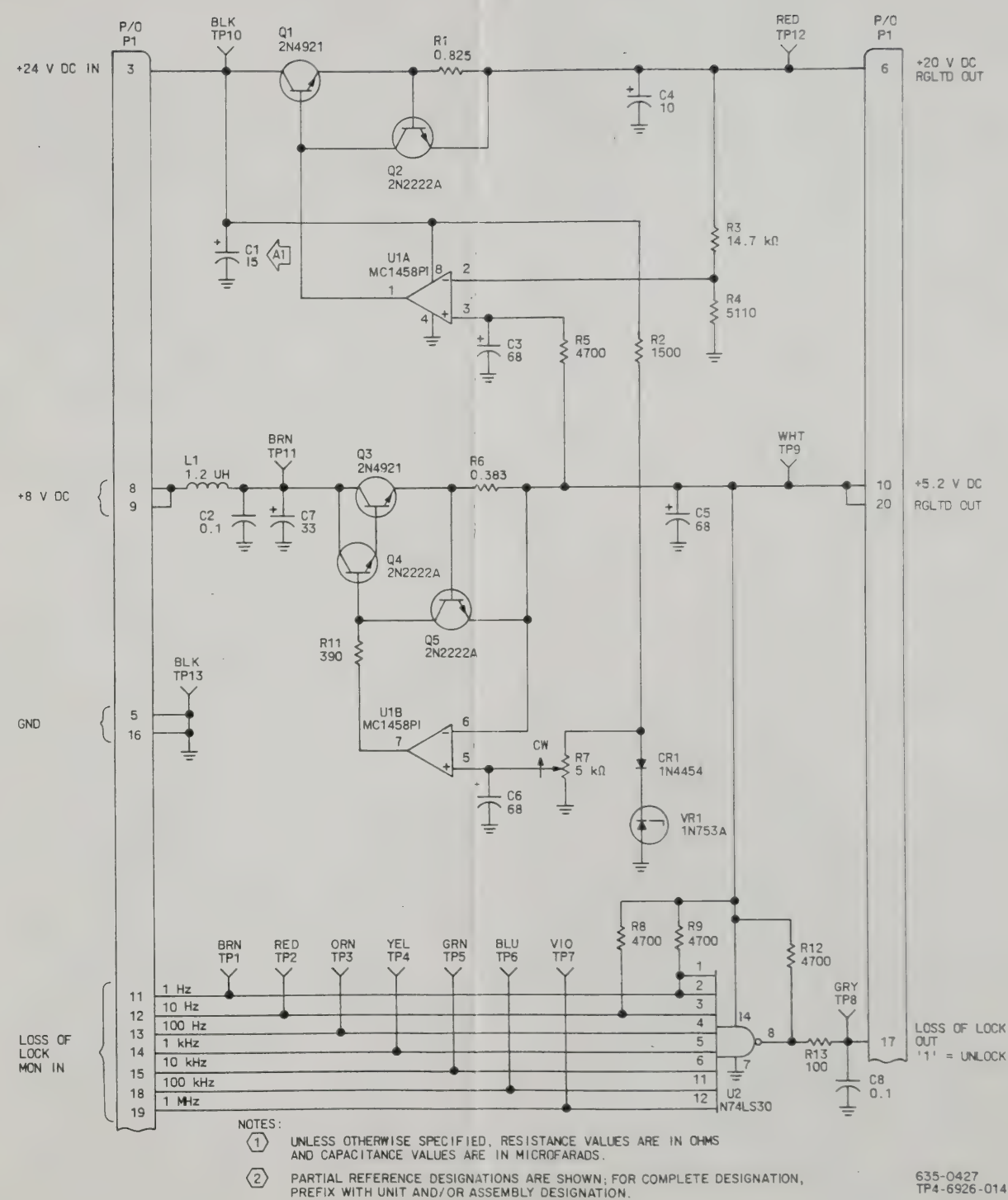
NOTATIONS ARE SHOWN; FOR COMPLETE DESIGNATION,
SEE ASSEMBLY DESIGNATION.

635-0427
TP4-6926-014

Synthesizer Voltage Regulator, Schematic Diagram
Figure 3 (Sheet 1 of 2)



TP5-1064-019



Synthesizer Voltage Regulator, Schematic Diagram
Figure 3 (Sheet 1 of 2)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
CP1	SYNTH VOLTAGE REGULATOR	635-0656-001		
	SEMICONV DEVICE	353-3644-010		03508
C1	CAPACITOR,FXD CER DIEI.,-0.1UF, 20%, 50V (A1)	913-3279-200		16546
C1	CAPACITOR,FXD ELCTLT, 15UF, 20%, 35V	184-9102-420		56289
C2	CAPACITOR,FXD CER DIEI., 0.1UF, 20%, 50V	913-3279-200		16546
C3	CAPACITOR,FXD ELCTLT, 68UF, 20%, 6V	184-9102-040		56289
C4	CAPACITOR,FXD ELCTLT, 10UF, 20%, 25V	184-9102-240		56289
C5,C6	CAPACITOR,FXD ELCTLT, 68UF, 20%, 6V	184-9102-040		56289
C7	CAPACITOR,FXD ELCTLT, 33UF, 20%, 25V	184-9102-260		56289
C8	CAPACITOR,FXD CER DIEI., 0.1UF, 20%, 50V	913-3279-200		16546
L1	COIL,RF 1.20UH	240-2715-140		96906
Q1	TRANSISTOR	352-0782-010		04713
Q2	TRANSISTOR	352-0661-020		07263
Q3	TRANSISTOR	352-0782-010		04713
Q4,Q5	TRANSISTOR	352-0661-020		07263
R1	RESISTOR,FXD 0.825 OHMS, 1%, 1W	747-1499-340		81349
R2	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/2W	745-1359-000		81349
R3	RESISTOR,FXD FILM, 14.7K, 1%, 1/8W	705-1052-000		81349
R4	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W	705-1030-000		81349
R5	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349
R6	RESISTOR,FXD 0.383 OHMS, 1%, 1W	747-1499-270		81349
R7	RESISTOR,VAR WW, 5K, PCRM5%, 3/4W	381-1721-390		81349
R8,R9	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349
R10	NOT USED			
R11	RESISTOR,FXD CMPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349
R12	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349
R13	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349
TP1	JACK,TIP BRN	360-0484-070		74970
TP2	JACK,TIP RED	360-0484-020		74970
TP3	JACK,TIP GRN	360-0484-050		74970
TP4	JACK,TIP YEL	360-0484-060		74970
TP5	JACK,TIP GRN	360-0484-040		74970
TP6	JACK,TIP BLU	360-0484-080		74970
TP7	JACK,TIP VIO	360-0484-090		74970
TP8	JACK,TIP GRA	360-0484-100		74970
TP9	JACK,TIP WHT	360-0484-010		74970
TP10	JACK,TIP BLK	360-0484-030		74970
TP11	JACK,TIP BRN	360-0484-070		74970
TP12	JACK,TIP RED	360-0484-020		74970
TP13	JACK,TIP BLK	360-0484-030		74970
U1	INTEGRATED CIRCUIT	351-1071-070		04713
U2	INTEGRATED CIRCUIT	351-1523-140		18324
VR1	SEMICONV DEVICE	353-2714-000		61483

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed C1 from 0.1μF to 15μF.	REV C and above

Schematic Diagram

2)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	SYNTH VOLTAGE REGULATOR	635-0656-001			
CR1	SEMICOND DEVICE	353-3644-010		03508	1N4454GE
C1	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V (A1)	913-3279-200		16546	CY30C104M
C1	CAPACITOR,FXD ELCTLT, 15UF, 20%, 35V	184-9102-420		56289	19901013
C2	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C3	CAPACITOR,FXD ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	1990686X0006DB1
C4	CAPACITOR,FXD ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	1990106X0025CB1
C5,C6	CAPACITOR,FXD ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	1990686X0006DB1
C7	CAPACITOR,FXD ELCTLT, 33UF, 20%, 25V	184-9102-260		56289	19901009
C8	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
L1	COIL,RF 1.20UH	240-2715-140		96905	MS75038-2
Q1	TRANSISTOR	352-0782-010		04713	2N4921
Q2	TRANSISTOR	352-0661-020		07263	2N2222A
Q3	TRANSISTOR	352-0782-010		04713	2N4921
Q4,Q5	TRANSISTOR	352-0661-020		07263	2N2222A
R1	RESISTOR,FXD 0.825 OHMS, 1%, 1W	747-1499-340		81349	RW70UR825F
R2	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/2W	745-1359-000		81349	RCR20G152KS
R3	RESISTOR,FXD FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN55D1472F
R4	RESISTOR,FXD FILM, 5.11K, 1%, 1/8W	705-1030-000		81349	RN55D5111F
R5	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R6	RESISTOR,FXD 0.353 OHMS, 1%, 1W	747-1499-270		81349	RW70UR363F
R7	RESISTOR,VAR 1W, 5K, FORM5Z, 3/4W	381-1721-390		81349	RT22C2X502
R8,R9	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R10	NOT USED				
R11	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR07G391KS
R12	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R13	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-001
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-001
TP3	JACK,TIP GRN	360-0484-050		74970	105-1106-001
TP4	JACK,TIP YEL	360-0484-060		74970	105-1107-001
TP5	JACK,TIP GRN	360-0484-040		74970	105-1104-001
TP6	JACK,TIP BLU	360-0484-080		74970	105-1110-001
TP7	JACK,TIP VIO	360-0484-090		74970	105-1112-001
TP8	JACK,TIP GRA	360-0484-100		74970	105-1113-001
TP9	JACK,TIP WHT	360-0484-010		74970	105-1101-001
TP10	JACK,TIP BLK	360-0484-030		74970	105-1103-001
TP11	JACK,TIP BRN	360-0484-070		74970	105-1108-001
TP12	JACK,TIP RED	360-0484-020		74970	105-1102-001
TP13	JACK,TIP BLK	360-0484-030		74970	105-1103-001
U1	INTEGRATED CIRCUIT	351-1071-070		04713	MC1458P1
U2	INTEGRATED CIRCUIT	351-1523-140		18324	N74LS30N
VR1	SEMICOND DEVICE	353-2714-000		81483	1N753A

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed C1 from 0.1μF to 15μF.	REV C and above

Synthesizer Voltage Regulator, Schematic Diagram
Figure 3 (Sheet 2)



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0770714-001211

1 January 1981

Synthesizer Subcarrier Generator
(638-6962-001)

Synthesizer Subcarrier Generator (638-6962-001)

Printed in USA

1. DESCRIPTION

Synthesizer Subcarrier Generator 638-6962-001, shown in figure 1, is a 3-layer planar card with a 20-pin edge-on connector.

The synthesizer subcarrier generator uses three phase-locked loops to produce output frequencies of 456.29 kHz and 443.71 kHz. These frequencies are used in a receiver-exciter when using UUSB (channel A2, upper-upper sideband) and LLSB (channel B2, lower-lower sideband) modes of operation.

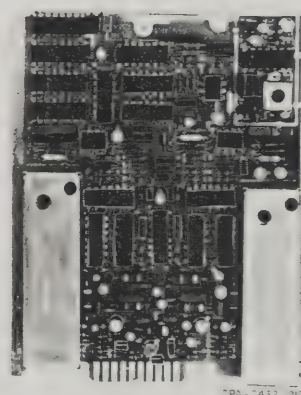
2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 2.)

The synthesizer subcarrier generator receives input reference signals of 450 kHz and 100 kHz and a 450-kHz enable signal from an external source. In addition to the rf input signals, +20-V dc and +5-V dc voltages are required. The output signals are 456.29 kHz (channel A2), 443.71 kHz (channel B2), and a subcarrier generator status signal.

The three phase-locked loops are identified in figure 2 as follows:

- The 456.29 kHz phase-locked loop consists of loop mixer (Q5), squaring amplifier (U6D, E, F), phase/frequency detector (U1, U2, U3), integrator-filter (U4A, B) and vco-buffer (Q1, Q2, Q3).
- The 443.71 kHz phase-locked loop consists of loop mixer (Q7), squaring amplifier (U6A, B, C), phase/frequency detector (U17, U18, U19), integrator-filter (U20A, B), and vco-buffer (Q8, Q9, Q10).



Synthesizer Subcarrier Generator
Figure 1

- The 6.29-kHz, phase-locked loop consists of divide-by-100 circuits (U7, U13), phase/frequency detector (U8, U9, U10), divide-by-629 circuit (U15, U16), integrator-filter (U11A), 629-kHz vco (U12) and logic converter (Q4).

A 100-kHz reference signal from an external source is divided by 100 and routed as a 1-kHz signal to a phase/frequency detector. A 629-kHz vco signal is also routed through a divide-by-629 circuit to the phase/frequency detector. The phase/frequency detector provides two outputs to the integrator-filter. When the input signals are in phase, the two outputs are high. When the input signals are out of phase, one output signal is high and the other is low. The output signals from the phase/frequency detector are filtered by an RC circuit in the integrator-filter. A dual-input integrator responds to the relative difference of potential of the inputs. The output remains

523-0770714-001211

constant if both inputs are at the same voltage level. However, when the voltage level of the inputs are different, the integrator output will vary at a rate and magnitude determined by the voltage difference of the inputs. The output of the integrator is applied to the vco. The vco output frequency is controlled by this closed loop. The output (629 kHz) of the vco is also routed through a logic converter to a divide-by-100 circuit. This circuit provides a 6.29-kHz reference signal for both output phase-locked loops.

A 450-kHz reference signal from an external source is amplified, buffered, and routed to the two output phase-locked loops. The 450-kHz reference signal is mixed with a voltage-controlled oscillator signal in a loop mixer. The resultant signal (6.29 kHz) is routed through a squaring amplifier to a phase/frequency detector. The phase of the 6.29-kHz reference signal is compared with the phase of the 6.29-kHz, phase-locked loop signal. The output voltages of the phase/frequency detector are routed through an integrator-filter to the vco as previously explained. The vco output frequency is controlled by this closed loop.

2.2 6.29-kHz, Phase-Locked Loop (Refer to figure 2 and figure 3, the schematic diagram.)

A 100-kHz signal from an external source is routed from connector P1-14 to the divide-by-100 integrated circuit U7. U7 is a high-speed, programmable down counter. It is connected to divide the input signal of 100 kHz by a factor of 100 and to produce an output signal of 1 kHz. This signal is applied to a NAND gate (U8A) in the phase/frequency detector.

The other input to the phase/frequency detector originates in the 629-kHz vco (U12). The output of vco is routed to logic converter Q4. This circuit converts the vco output logic from emitter-coupled logic to transistor-to-transistor logic. The reference vco output frequency (629 kHz) is routed to a divide-by-629 circuit (U15 and U16). The output of 1 kHz from this circuit is routed to the phase/frequency detector.

The phase/frequency detector (U8A, B, C, U9A, B, C, and U10) receives two input signals and provides two outputs to the integrator-filter. A reference input signal of 1 kHz is provided by the divide-by-100 circuit (U7). A variable input signal of 1 kHz is provided by the divide-by-629 circuit (U15 and U16). When the reference and variable input signals are in phase, the output signals of the phase/frequency detector are both high. When the input signals are out of phase, one output is high and the other is low.

The phase/frequency discriminator is triggered by the negative edge of the reference and variable input signals. The two output signals are both high if the reference and variable input signals are in phase. If the variable input signal leads the reference input signal, one output (variable) will be low for the time interval between the variable and reference input pulses. If the variable input signal lags the reference signal, one output (reference) will be low for the time interval between the variable and reference input pulses. The output voltages are routed to the integrator-filter.

The integrator-filter consists of operational amplifier U11A and the associated circuit. The filter bandwidth is narrow enough to reduce spurious levels and wide enough to minimize lock time and allow the natural tendency of the phase-lock loop to track the desired signal. This signal is routed to varicap CR5 in the vco. As the capacitance of the varicap varies, the frequency of the vco changes.

The reference vco output frequency (629 kHz) is also routed to a divide-by-100 circuit U13. The output of this circuit (6.29 kHz) is applied to the phase/frequency detectors in the 456.29 kHz and 443.71 kHz phase-locked output loops.

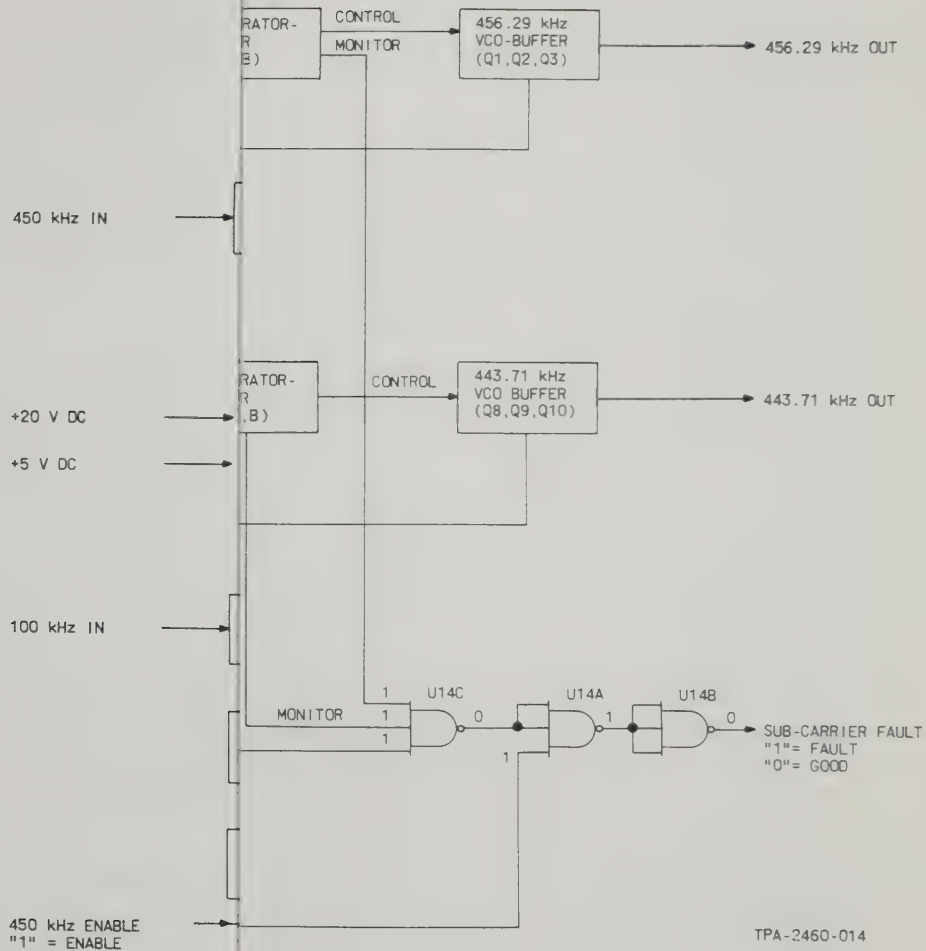
2.3 456.29-kHz Phase-Locked Loop (Refer to figure 2 and figure 3, the schematic diagram.)

A 450-kHz signal from an external source is routed from connector P1-16 to the 450-kHz buffer (Q6). The buffer circuit provides amplification and isolation. The buffer provides input signal for the loop mixers of both the 456.29-kHz and 443.71-kHz, phase-locked loops.

The loop mixer (Q5) is a dual gate MOSFET. The 450-kHz reference signal from the buffer is applied to gate 2, and the vco output frequency (456.29 kHz) is applied to gate 1. The mixer action produces an output signal of 6.29 kHz. This signal is routed through a low-pass filter to the squaring amplifier.

The squaring amplifier (U6D, E, F) is a three-stage amplifier-inverter. The squaring amplifier converts the sine-wave input into a square-wave output which is compatible with transistor-to-transistor logic. The 6.29-kHz input signal is amplified and buffered and routed to the phase/frequency detector.

The phase/frequency detector (U1, U2, U3) receives two input signals and provides two outputs to the



Synthesizer Subcarrier Generator, Block Diagram
Figure 2

constant if both inputs are at the same voltage level. However, when the voltage level of the inputs are different, the integrator output will vary at a rate and magnitude determined by the voltage difference of the inputs. The output of the integrator is applied to the vco. The vco output frequency is controlled by this closed loop. The output (629 kHz) of the vco is also routed through a logic converter to a divide-by-100 circuit. This circuit provides a 6.29-kHz reference signal for both output phase-locked loops.

A 450-kHz reference signal from an external source is amplified, buffered, and routed to the two output phase-locked loops. The 450-kHz reference signal is mixed with a voltage-controlled oscillator signal in a loop mixer. The resultant signal (6.29 kHz) is routed through a squaring amplifier to a phase/frequency detector. The phase of the 6.29-kHz reference signal is compared with the phase of the 6.29-kHz, phase-locked loop signal. The output voltages of the phase/frequency detector are routed through an integrator-filter to the vco as previously explained. The vco output frequency is controlled by this closed loop.

2.2 6.29-kHz, Phase-Locked Loop (Refer to figure 2 and figure 3, the schematic diagram.)

A 100-kHz signal from an external source is routed from connector P1-14 to the divide-by-100 integrated circuit U7. U7 is a high-speed, programmable down counter. It is connected to divide the input signal of 100 kHz by a factor of 100 and to produce an output signal of 1 kHz. This signal is applied to a NAND gate (U8A) in the phase/frequency detector.

The other input to the phase/frequency detector originates in the 629-kHz vco (U12). The output of vco is routed to logic converter Q4. This circuit converts the vco output logic from emitter-coupled logic to transistor-to-transistor logic. The reference vco output frequency (629 kHz) is routed to a divide-by-629 circuit (U15 and U16). The output of 1 kHz from this circuit is routed to the phase/frequency detector.

The phase/frequency detector (U8A, B, C, U9A, B, C, and U10) receives two input signals and provides two outputs to the integrator-filter. A reference input signal of 1 kHz is provided by the divide-by-100 circuit (U7). A variable input signal of 1 kHz is provided by the divide-by-629 circuit (U15 and U16). When the reference and variable input signals are in phase, the output signals of the phase/frequency detector are both high. When the input signals are out of phase, one output is high and the other is low.

The phase/frequency discriminator is triggered by the negative edge of the reference and variable input signals. The two output signals are both high if the reference and variable input signals are in phase. If the variable input signal leads the reference input signal, one output (variable) will be low for the time interval between the variable and reference input pulses. If the variable input signal lags the reference signal, one output (reference) will be low for the time interval between the variable and reference input pulses. The output voltages are routed to the integrator-filter.

The integrator-filter consists of operational amplifier U11A and the associated circuit. The filter bandwidth is narrow enough to reduce spurious levels and wide enough to minimize lock time and allow the natural tendency of the phase-lock loop to track the desired signal. This signal is routed to varicap CR5 in the vco. As the capacitance of the varicap varies, the frequency of the vco changes.

The reference vco output frequency (629 kHz) is also routed to a divide-by-100 circuit U13. The output of this circuit (6.29 kHz) is applied to the phase/frequency detectors in the 456.29 kHz and 443.71 kHz phase-locked output loops.

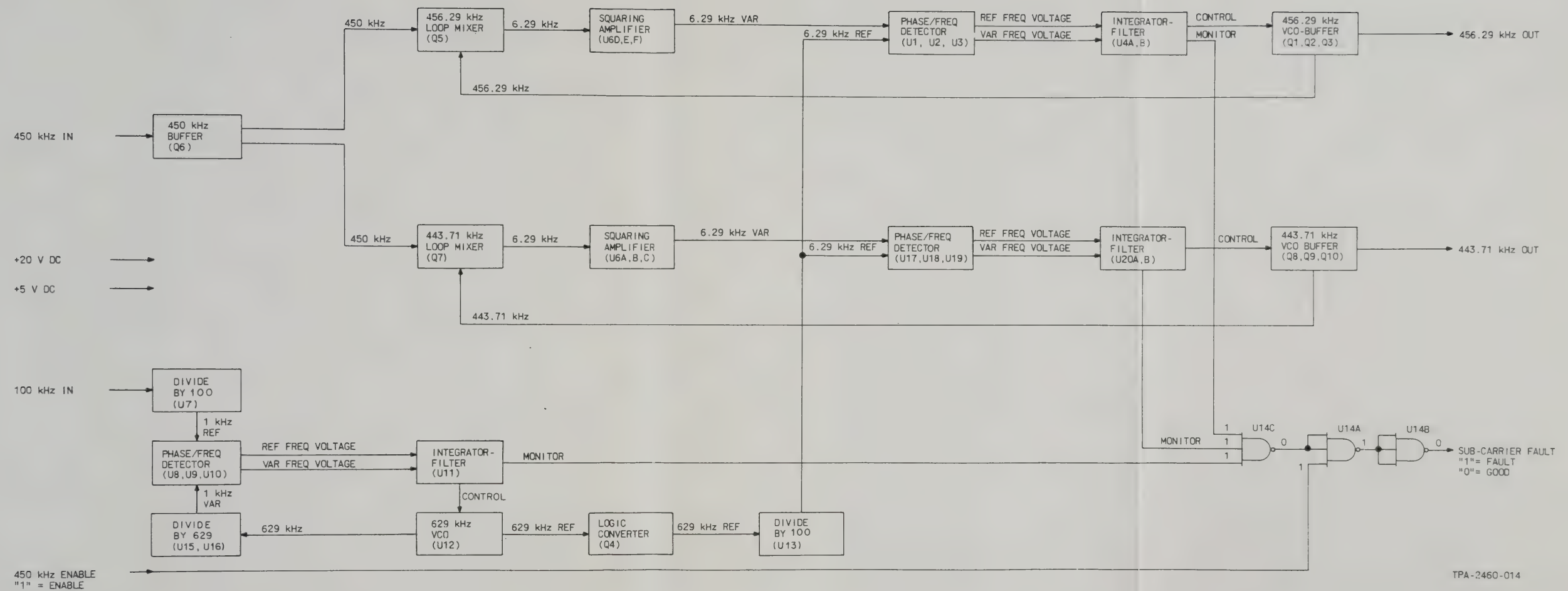
2.3 456.29-kHz Phase-Locked Loop (Refer to figure 2 and figure 3, the schematic diagram.)

A 450-kHz signal from an external source is routed from connector P1-16 to the 450-kHz buffer (Q6). The buffer circuit provides amplification and isolation. The buffer provides input signal for the loop mixers of both the 456.29-kHz and 443.71-kHz, phase-locked loops.

The loop mixer (Q5) is a dual gate MOSFET. The 450-kHz reference signal from the buffer is applied to gate 2, and the vco output frequency (456.29 kHz) is applied to gate 1. The mixer action produces an output signal of 6.29 kHz. This signal is routed through a low-pass filter to the squaring amplifier.

The squaring amplifier (U6D, E, F) is a three-stage amplifier-inverter. The squaring amplifier converts the sine-wave input into a square-wave output which is compatible with transistor-to-transistor logic. The 6.29-kHz input signal is amplified and buffered and routed to the phase/frequency detector.

The phase/frequency detector (U1, U2, U3) receives two input signals and provides two outputs to the



Synthesizer Subcarrier Generator, Block Diagram
Figure 2

integrator-filter. A 6.29-kHz variable signal is provided by the squaring amplifier (U6D, E, F). A 6.29-kHz reference signal is provided by the 6.29-kHz, phase-locked loop. When the reference and variable input signals are in phase, the output signals of the phase/frequency detector are both high. When the input signals are out of phase, one output is high and the other is low.

The phase/frequency discriminator is triggered by the negative edge of the reference and variable input signals. The two output signals are both high if the reference and variable input signals are in phase. If the variable input signal leads the reference input signal, one output (variable) will be low for the time interval between the variable and reference input pulses. If the variable input signal lags the reference signal, one output (reference) will be low for the time interval between the variable and reference input pulses. The output voltages are routed to the integrator-filter.

The integrator-filter consists of two operational amplifiers (U4A, B) and RC filters. The output signals from the phase/frequency detector is applied to RC filters (R1-R4 and C1-C2). The RC filters act to smooth the signal. These signals are then applied to the dual inputs of integrator U4B. The integrator output remains constant if both inputs are at the same voltage level. If the input voltage levels are not equal, the integrator output will change at a rate and direction determined by the magnitude and polarity of the input voltage difference. The output signal from integrator U4B is routed to operational amplifier U4A. Operational amplifier U4A is an active filter. The output signal from operational amplifier U4A is applied to a voltage-variable capacitor in the vco-buffer. This signal controls the frequency of the vco.

The frequency of the voltage-controlled oscillator (Q1) is controlled by the input signal from the integrator-filter. This signal is applied to varicap CR2. As the input signal varies, the capacitance of varicap CR2 varies. This changes the frequency of the vco. The output of the vco is amplified and buffered by transistor amplifiers Q2 and Q3. The output signal (456.29 kHz) is routed to external circuits and to the 456.29-kHz loop mixer Q5.

2.4 443.71-kHz, Phase-Locked Loop (Refer to figure 2 and figure 3, the schematic diagram.)

With the exception of the output frequency, the operation of the 443.71-kHz, phase-locked loop and the

456.29-kHz, phase-locked loop are identical. Refer to paragraph 2.3 for the theory of operation of the 456.29-kHz, phase-locked loop.

2.5 Synthesizer Subcarrier Generator Status (Refer to figure 2 and figure 3, the schematic diagram.)

The synthesizer subcarrier generator status circuit consists of NAND gates U14A, B, and C. When the three phase-locked loops are in a locked status, a logic 1 signal is provided from lock detector diodes CR4, CR12; CR9, CR10; CR6, CR11; and associated circuits. With a logic 1 input to all terminals, NAND gate U14C produces a logic 0 output. This logic 0 is applied to U14A. If the other input (450-kHz enable) signal to U14A is logic 1, the output is a logic 1. NAND gate U14B acts as an inverter for these signals. If all conditions are normal, a logic 0 signal is available for monitoring by external circuits. If a fault occurs or a signal is lost, a fault signal (logic 1) is produced.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the synthesizer subcarrier generator are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 1 check the total performance of the synthesizer subcarrier generator. These procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic diagram (figure 3) to trace the source of the fault.

4. ALIGNMENT/ADJUSTMENT

Refer to table 1 for the following adjustments.

- a. 443.71-kHz output level, test 3
- b. 456.29-kHz output level, test 5
- c. 629-kHz loop control level, test 7
- d. 456.29-kHz loop control voltage, test 10
- e. 443.71-kHz loop control voltage, test 14

Table 1. Synthesizer Subcarrier Generator, Testing and Troubleshooting.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit containing the synthesizer subcarrier generator that is to be tested. b. Remove synthesizer subcarrier generator. Install it on an extender card, place it in the unit, and connect the extender coaxial cables. c. Set unit LINE SELECTOR switch to 115 V. d. Connect unit to 115 V ac power source and set power on. Initiate frequency change to clear unit fault.		
2. 443.71-kHz output level	Connect rf voltmeter to P1-11. Measure the output level.	300 $\pm$ 15 mV rms. If normal, proceed to test 4.	Proceed to test 3.
3. 443.71-kHz output level adjustment	a. Connect the rf voltmeter to P1-11. b. Refer to figure 3. Adjust R69 for an output level of 300 mV rms.	300 $\pm$ 15 mV rms.	Proceed to test 18, and troubleshoot the 443.71-kHz, phase-locked loop.
4. 456.29-kHz output level	Connect rf voltmeter to P1-20. Measure the output level.	300 $\pm$ 15 mV rms. If normal, proceed to test 6.	Proceed to test 5.
5. 456.29-kHz output level adjustment	a. Connect rf voltmeter to P1-20. b. Refer to figure 3. Adjust R16 for an output level of 300 mV rms.	300 $\pm$ 15 mV rms.	Proceed to test 18, and troubleshoot the 456.29-kHz, phase-locked loop.
6. 629-kHz loop control voltage measurement	Connect digital voltmeter (dvm) to test point E2 (figure 3). Measure the control voltage.	11.0 $\pm$ 0.2 V dc. If normal, proceed to test 8.	Proceed to test 7.
7. 629-kHz loop control voltage adjustment	a. Connect dvm as in test 6. b. Using a nonmetallic tuning tool, adjust inductor L5 (figure 3) for an indication of 11.0 V dc on the dvm. Note Suggested setting for oscilloscope controls for ripple content measurements. Horizontal scale-1 ms/cm. Vertical channel coupling-ac. Vertical scale-as required. Triggering-internal.	11.0 $\pm$ 0.2 V dc.	Proceed to test 18.e, and troubleshoot the 629-kHz, phase-locked loop.

Table 1. Synthesizer Subcarrier Generator, Testing and Troubleshooting (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. 629-kHz loop ripple content	Connect oscilloscope to test point E2 (figure 3). Measure the ripple content.	0.2 V p-p maximum.	Proceed to test 18.e, and troubleshoot the 629-kHz, phase-locked loop.
9. 456.29-kHz loop control voltage measurement	Connect dvm to test point E1 (figure 3). Measure the control voltage.	11.5 $\pm$ 0.2 V dc. If normal, proceed to test 11.	Proceed to test 10.
10. 456.29-kHz loop control voltage adjustment	a. Connect dvm as in test 9. b. Using a nonmetallic tuning tool, adjust inductor L1 for an indication of 11.5 V dc on the dvm. c. Repeat test 5.	11.5 $\pm$ 0.2 V dc. Same as test 5.	Proceed to test 10.c. Same as test 5.
11. 456.29-kHz loop ripple content	Connect oscilloscope to test point E1 (figure 3). Measure the ripple content. Refer to test 8 for suggested oscilloscope control settings.	20 mV p-p maximum.	Proceed to test 18, and troubleshoot the 456.29-kHz, phase-locked loop.
12. 456.29-kHz frequency	Connect frequency counter to test point E1 (figure 3). Measure the frequency.	456.29 $\pm$ 0.005 kHz.	Proceed to test 18, and troubleshoot the 456.29-kHz, phase-locked loop.
13. 443.71-kHz loop control voltage measurement	Connect dvm to test point E3 (figure 3). Measure the control voltage.	11.5 $\pm$ 0.2 V dc. If normal, proceed to test 15.	Proceed to test 14.
14. 443.71-kHz loop control voltage adjustment	a. Connect dvm as in test 13. b. Using a nonmetallic tuning tool, adjust inductor L8 for an indication of 11.5 V dc on the dvm. c. Repeat test 3.	11.5 $\pm$ 0.2 V dc. Same as test 3.	Proceed to test 14.c. Same as test 3.
15. 443.71-kHz loop ripple content	Connect oscilloscope to test point E3 (figure 3). Measure the ripple content. Refer to test 8 for suggested oscilloscope control settings.	20 mV p-p maximum.	Proceed to test 18, and troubleshoot the 443.71-kHz, phase-locked loop.
16. 443.71-kHz frequency	Connect frequency counter to test point E3 (figure 3). Measure the frequency.	443.71 $\pm$ 0.005 kHz.	Proceed to test 18, and troubleshoot the 443.71-kHz, phase-locked loop.
17. Fault detection circuit	Connect dvm across TP2(+) and TP1(-). Refer to figure 3. Measure the voltage.	Logic 0.	1. Check 450-kHz enable signal at P1-13. 2. Check U14 and associated circuit.
(Cont)			

Table 1. Synthesizer Subcarrier Generator, Testing and Troubleshooting (Cont).

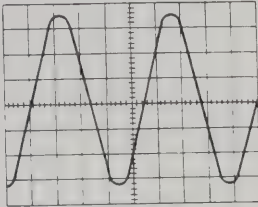
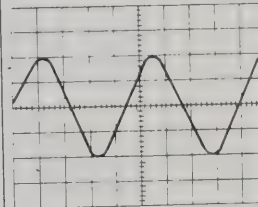
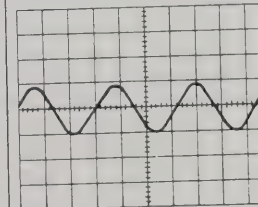
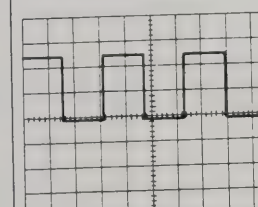
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
17. (Cont)	Note If normal indications were obtained in the preceding tests, the synthesizer subcarrier generator is operational. The following tests are used to isolate a fault to a component or circuit.		
18. Trouble-shooting	a. Connect oscilloscope to gate 2 of Q5 or Q7. Observe waveform. Note In the troubleshooting procedures, refer to the parts location diagram for physical location of parts. Refer to the schematic diagram for circuit connections. b. Connect oscilloscope to gate 1 of Q5 or Q7. Observe waveform. c. Connect oscilloscope to U6 pins 9/7. Observe waveform. d. Connect oscilloscope to U6 pins 2/15. Observe waveform.	 Vert - 1 V/div Horz - 0.5 μs/div  Vert - 0.1 V/div Horz - 0.5 μs/div  Vert - 0.5 V/div Horz - 50 μs/div  Vert - 2 V/div Horz - 50 μs/div	1. Check 450-kHz input signal at P1-16. 2. Check +20 V dc at P1-7. 3. Check Q6 and associated circuit. 4. Check input circuit of Q5 or Q7. 1. Check 456.29-kHz vco-buffer (Q1, Q2, Q3) or 443.71-kHz vco-buffer (Q8, Q9, Q10). 2. Check input circuit. 1. Check Q5 or Q7 and associated circuit. 2. Check +5 V dc at P1-8. Check U6 and associated circuit.
(Cont)			

Table 1. Synthesizer Subcarrier Generator, Testing and Troubleshooting (Cont).

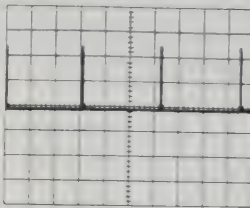
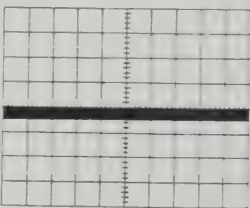
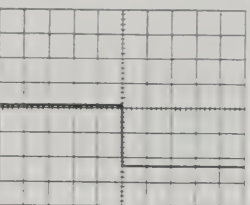
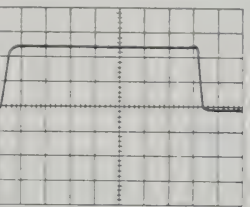
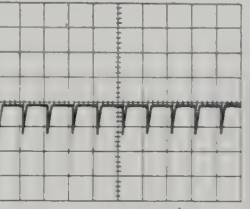
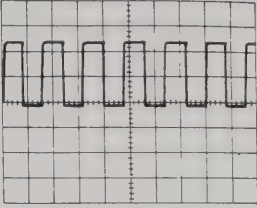
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
18. (Cont)	e. Connect oscilloscope to U13 pin 1. Observe waveform.	 Vert - 2 V/div Horz - 50 μs/div	1. Check U13 and associated circuit. 2. Proceed to test 18.g.
	f. Connect oscilloscope to test point E1/E3. Observe waveform. Typically all that is seen at these test points is low-level, high-frequency noise.	 Vert - 10 mV/div Horz - 1 ms/div	Check U4 or U20 and associated circuit.
	Note Unless a fault exists in the 629-kHz loop circuit, the synthesizer sub-carrier generator is operational.		
	g. Connect oscilloscope to U7 - pin 1. Observe waveform.	 Vert - 2 V/div Horz - 2 μs/div	1. Check 100-kHz input signal at P1-14. 2. Check U7 and associated circuit.
	h. Connect oscilloscope to U16 - pin 1. Observe waveform.	 Vert - 2 V/div Horz - 0.2 μs/div	Check U16, U15, and associated circuits.
(Cont)	i. Connect oscilloscope to test point E2. Observe waveform. The amplitude and polarity of this waveform may vary greatly.	 Vert - 20 mV/div Horz - 1 ms/div	Check U8, U9, U10, U11, and associated circuit.

Table 1. Synthesizer Subcarrier Generator, Testing and Troubleshooting (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
18. (Cont)	j. Connect oscilloscope to collector of Q4. Observe waveform.	 Vert - 2 V/div Horz - 1 μs/div	1. Check Q4 and associated circuit. 2. Check U12 and associated circuit.

5. REPAIR

Repair of the synthesizer subcarrier generator is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

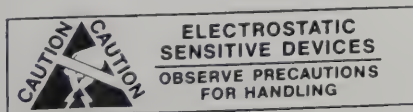
6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 3). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

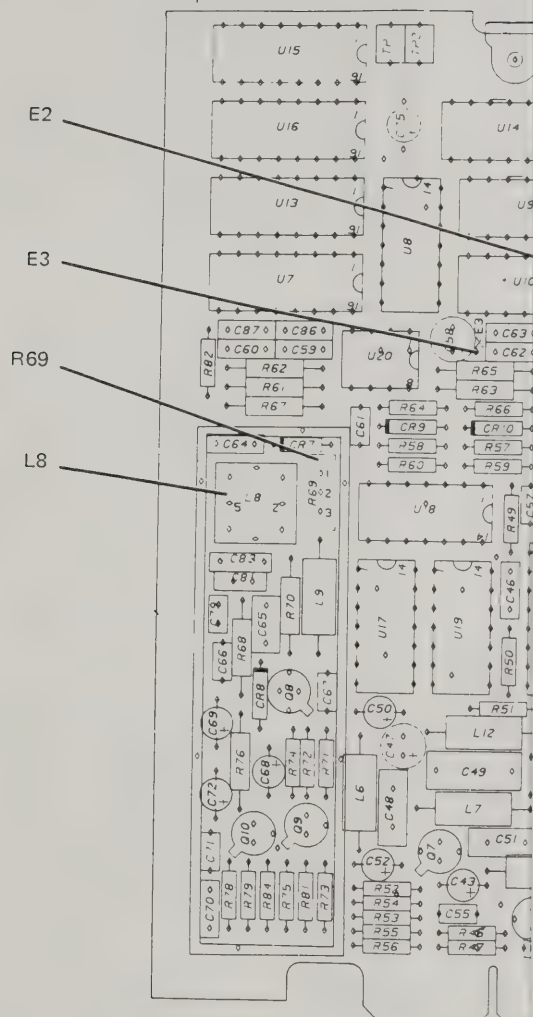
<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
02113	COILCRAFT INC 1102 SILVER LAKE RD CARY IL 60013
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054
18796	ERIE TECHNOLOGICAL PRODUCTS INC STATE COLLEGE DIV 1900 W COLLEGE AVE STATE COLLEGE PA 16801
25088	SIEMENS CORP 186 WOOD AVE S ISELIN NJ 08830

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
28480	HEWLETT-PACKARD CO CORPORATE HQ 1501 PAGE MILL RD PALO ALTO CA 94304
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS INC 644 W 12TH ST ERIE PA 16512
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
80294	BOURNS INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
93958	REPUBLIC ELECTRONICS CORP 176 E 7TH ST PATERSON NJ 07524
96906	MILITARY STANDARD

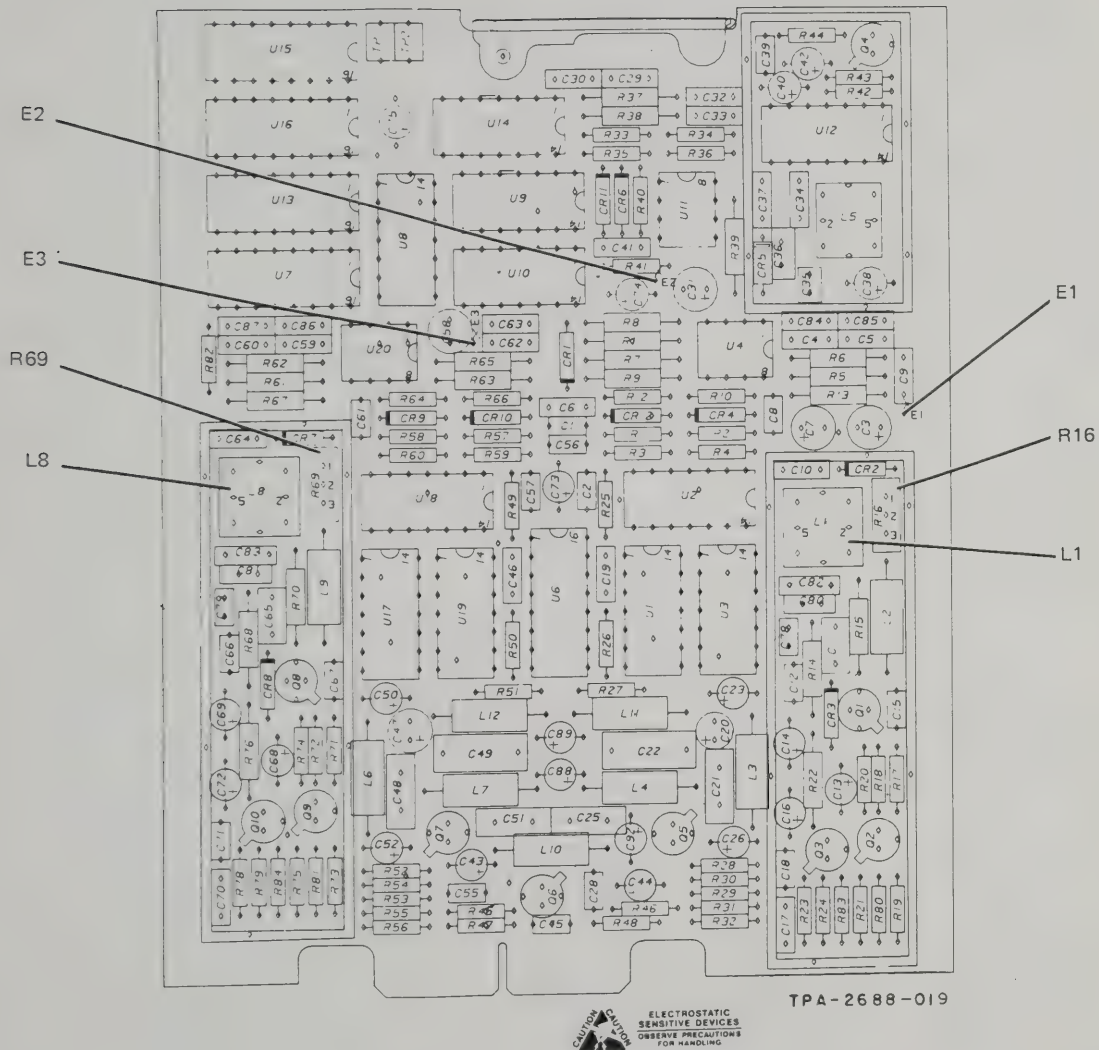
6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Synthesizer Subcarrier Generator	638-6962-001	REV D



Synthesizer Subcarrier
Figure 1



Synthesizer Subcarrier Generator, Schematic Diagram
Figure 3 (Sheet 1 of 3)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR COD
CR1	SYNTHESIZER SUBCARRIER GENERATOR (ESDS)	638-6962-001		
CR2	SEMICONDUCTOR DEVICE	353-3644-010		0350
CR3,CR4	SEMICONDUCTOR DEVICE (ESDS)	922-6131-010		2500
CR5	SEMICONDUCTOR DEVICE	353-3691-010		2840
CR6	SEMICONDUCTOR DEVICE (ESDS)	922-6131-010		2500
CR7	SEMICONDUCTOR DEVICE	353-3691-010		2840
CR8-CR12	SEMICONDUCTOR DEVICE (ESDS)	922-6131-010		2500
C1,C2	CAPACITOR,FXD CER DIE, 5600PF, FORM10%, 100V	353-3691-010		2840
C3	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	913-5019-170		8134
C4,C5	CAPACITOR,FXD CER DIE, 0.68UF, FORM10%, 50V	184-9102-240		5620
C6	CAPACITOR,FXD CER DIE, 0.033UF, FORM10%, 100V	913-5019-540		8134
C7	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	913-5019-380		8134
C8	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	184-9102-240		5620
C9	CAPACITOR,FXD CER DIE, 0.068UF, FORM10%, 100V	913-5019-200		8134
C10	CAPACITOR,FXD CER DIE, 0.1UF, FORM10%, 100V	913-5019-420		8134
C11	CAPACITOR,FXD CER DIE, 1200PF, FORM5%, 100V	913-5019-440		8134
C12	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-3281-290		1870
C13,C14	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	913-5019-200		8134
C15	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	184-9102-660		5620
C16	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	913-5019-200		8134
C17	CAPACITOR,FXD CER DIE, 0.1UF, FORM10%, 100V	184-9102-660		5620
C18	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-5019-440		8134
C19	CAPACITOR,FXD CER DIE, 0.1UF, FORM10%, 100V	913-5019-200		8134
C20	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	913-5019-440		8134
C21	CAPACITOR,FXD CER DIE, 4700PF, FORM5%, 100V	184-9102-240		5620
C22	CAPACITOR,FXD CER DIE, 0.015UF, FORM10%, 100V	913-3281-370		1870
C23	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	913-3281-230		1870
C24	NOT USED	184-9102-660		5620
C25	CAPACITOR,FXD CER DIE, 4700PF, FORM5%, 100V	913-3281-370		1870
C26	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C27	NOT USED			
C28	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-5019-200		8134
C29,C30	CAPACITOR,FXD CER DIE, 0.033UF, FORM10%, 100V	913-5019-380		8134
C31	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		5620
C32,C33	CAPACITOR,FXD CER DIE, 0.68UF, FORM10%, 50V	913-5019-540		8134
C34	CAPACITOR,FXD CER DIE, 0.1UF, FORM10%, 100V	913-5019-440		8134
C35	CAPACITOR,FXD CER DIE, 0.00015UF, 5%, 100V	913-3117-050		5620
C36	CAPACITOR,FXD MICA DIE, 33PF, 5%, 50V	912-4141-220		9370
C37	CAPACITOR,FXD CER DIE, 0.1UF, FORM10%, 100V	913-5019-440		8134
C38	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C39	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-5019-200		8134
C40	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C41	CAPACITOR,FXD CER DIE, 0.033UF, FORM10%, 100V	913-5019-380		8134
C42	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C43,C44	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C45	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-5019-200		8134
C46	CAPACITOR,FXD CER DIE, 0.1UF, FORM10%, 100V	913-5019-440		8134
C47	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		5620
C48	CAPACITOR,FXD CER DIE, 4700PF, FORM5%, 100V	913-3281-370		1870
C49	CAPACITOR,FXD CER DIE, 0.015UF, FORM10%, 100V	913-3281-230		1870
C50	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C51	CAPACITOR,FXD CER DIE, 4700PF, FORM5%, 100V	913-3281-370		1870
C52	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C53,C54	NOT USED			
C55	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-5019-200		8134
C56,C57	CAPACITOR,FXD CER DIE, 5600PF, FORM10%, 100V	913-5019-170		8134
C58	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		5620
C59,C60	CAPACITOR,FXD CER DIE, 0.68UF, FORM10%, 50V	913-5019-540		8134
C61	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-5019-200		8134
C62	CAPACITOR,FXD CER DIE, 0.068UF, FORM10%, 100V	913-5019-420		8134
C63	CAPACITOR,FXD CER DIE, 0.033UF, FORM10%, 100V	913-5019-380		8134
C64	CAPACITOR,FXD CER DIE, 0.1UF, FORM10%, 100V	913-5019-440		8134
C65	CAPACITOR,FXD CER DIE, 1200PF, FORM5%, 100V	913-3281-290		1870
C66,C67	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-5019-200		8134
C68,C69	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C70	CAPACITOR,FXD CER DIE, 0.1UF, FORM10%, 100V	913-5019-440		8134
C71	CAPACITOR,FXD CER DIE, 0.01UF, FORM10%, 100V	913-5019-200		8134
C72-C75	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C76,C77	NOT USED			
C78,C79	CAPACITOR,FXD CER DIE, 0.00033UF, 5%, 100V	913-3117-070		5620
C80,C81	CAPACITOR,FXD CER DIE, 47PF, 10%, 75V	913-1098-020		7290
C82,C83	CAPACITOR,FXD CER DIE, 180PF, 2%, 75V	913-3872-000		9390
C84-C87	CAPACITOR,FXD CER DIE, 0.82UF, FORM10%, 50V	913-5019-550		8134
C88,C89	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
C90,C91	NOT USED			
C92	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		5620
L1	INDUCTOR,RF	242-0441-010		0210
L2	COIL,RF 10000UH	240-2715-610		9690
L3,L4	COIL,RF 12000UH	240-2715-620		9690
L5	INDUCTOR,RF	242-0441-010		0210
L6,L7	COIL,RF 12000UH	240-2715-620		9690
L8	INDUCTOR,RF	242-0441-010		0210
L9,L10	COIL,RF 10000UH	240-2715-610		9690
L11,L12	COIL,RF 15000UH	240-2715-630		9690
Q1	TRANSISTOR (ESDS)	352-0756-010		1780
Q2-Q4	TRANSISTOR	352-0661-020		0720
Q5	TRANSISTOR (ESDS)	352-1093-010		0870
Q6	TRANSISTOR (ESDS)	352-0756-010		1780
Q7	TRANSISTOR (ESDS)	352-1093-010		0870

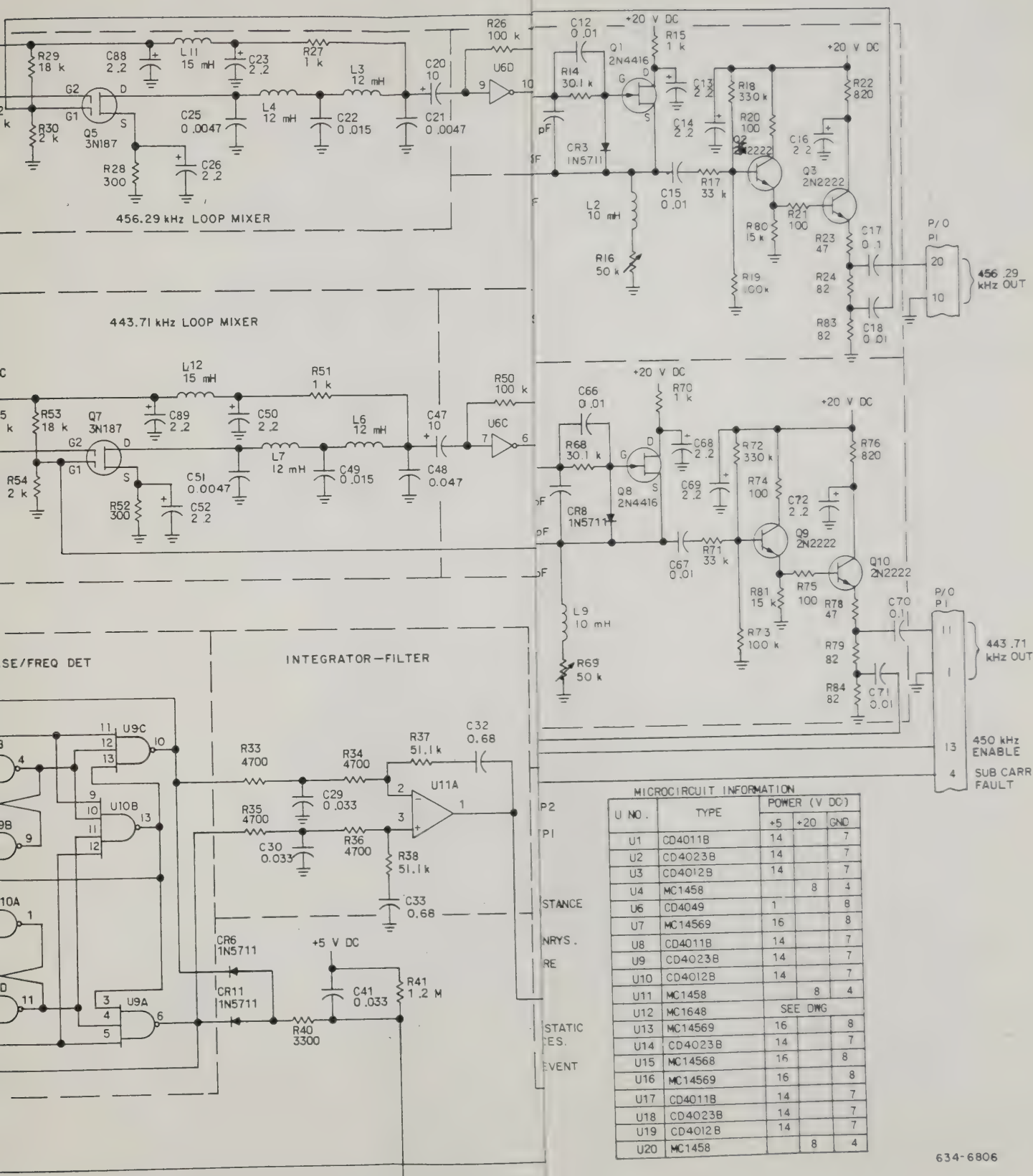
Synthesizer Subcarrier Generator, Schematic Diagram
Figure 3 (Sheet 2)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
CR1	SYNTHESIZER SUBCARRIER GENERATOR (ESDS)	630-6962-001			
CR2	SEMICOND DEVICE	353-3644-010		03508	1N4454GE
CR3,CR4	SEMICOND DEVICE (ESDS)	922-6131-010		25088	8B109-6131-010
CR5	SEMICOND DEVICE	353-3691-010		20480	1N5711
CR6	SEMICOND DEVICE (ESDS)	922-6131-010		25088	8B109-6131-010
CR7	SEMICOND DEVICE	353-3691-010		20480	1N5711
CR8-CR12	SEMICOND DEVICE (ESDS)	922-6131-010		25088	8B109-6131-010
C1,C2	CAPACITOR,FXD CER DIEL, 5600PF, PORM10%, 100V	913-5019-170		81349	CK05BX562K
C3	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	1990106X0025CB1
C4,C5	CAPACITOR,FXD CER DIEL, 0.68UF, PORM10%, 50V	913-5019-540		81349	CK06BX684K
C6	CAPACITOR,FXD CER DIEL, 0.033UF, PORM10%, 100V	913-5019-380		81349	CK06BX333K
C7	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	1990106X0025CB1
C8	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C9	CAPACITOR,FXD CER DIEL, 0.068UF, PORM10%, 100V	913-5019-420		81349	CK06BX683K
C10	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C11	CAPACITOR,FXD CER DIEL, 1200PF, PORM5%, 100V	913-3281-290		18796	8131-100C0G122J
C12	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C13,C14	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C15	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C16	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C17	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C18	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C19	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C20	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	1990106X0025CB1
C21	CAPACITOR,FXD CER DIEL, 4700PF, PORM5%, 100V	913-3281-370		18796	8141H100C0G472J
C22	CAPACITOR,FXD CER DIEL, 0.015UF, PORM10%, 100V	913-3281-230		18796	8151-100C0G153K
C23	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C24	NOT USED				
C25	CAPACITOR,FXD CER DIEL, 4700PF, PORM5%, 100V	913-3281-370		18796	8141H100C0G472J
C26	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C27	NOT USED				
C28	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C29,C30	CAPACITOR,FXD CER DIEL, 0.033UF, PORM10%, 100V	913-5019-380		81349	CK06BX333K
C31	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	1990106X0025CB1
C32,C33	CAPACITOR,FXD CER DIEL, 0.68UF, PORM10%, 50V	913-5019-540		81349	CK06BX684K
C34	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C35	CAPACITOR,FXD CER DIEL, 0.00015UF, 5%, 100V	913-3117-050		56289	1CC0G151X5100C4
C36	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V	912-4141-220		93790	CD5EY330J0
C37	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C38	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C39	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C40	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C41	CAPACITOR,FXD CER DIEL, 0.033UF, PORM10%, 100V	913-5019-380		81349	CK06BX333K
C42	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C43,C44	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C45	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C46	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C47	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	1990106X0025CB1
C48	CAPACITOR,FXD CER DIEL, 4700PF, PORM5%, 100V	913-3281-370		18796	8141H100C0G472J
C49	CAPACITOR,FXD CER DIEL, 0.015UF, PORM10%, 100V	913-3281-230		18796	8151-100C0G153K
C50	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C51	CAPACITOR,FXD CER DIEL, 4700PF, PORM5%, 100V	913-3281-370		18796	8141H100C0G472J
C52	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C53,C54	NOT USED				
C55	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C56,C57	CAPACITOR,FXD CER DIEL, 5600PF, PORM10%, 100V	913-5019-170		81349	CK05BX562K
C58	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	1990106X0025CB1
C59,C60	CAPACITOR,FXD CER DIEL, 0.68UF, PORM10%, 50V	913-5019-540		81349	CK06BX684K
C61	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C62	CAPACITOR,FXD CER DIEL, 0.068UF, PORM10%, 100V	913-5019-420		81349	CK06BX683K
C63	CAPACITOR,FXD CER DIEL, 0.033UF, PORM10%, 100V	913-5019-380		81349	CK06BX333K
C64	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C65	CAPACITOR,FXD CER DIEL, 1200PF, PORM5%, 100V	913-3281-290		18796	8131-100C0G122J
C66,C67	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C68,C69	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C70	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C71	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C72-C75	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C76,C77	NOT USED				
C78,C79	CAPACITOR,FXD CER DIEL, 0.00033UF, 5%, 100V	913-3117-070		56289	1CC0X361X5100C4
C80,C81	CAPACITOR,FXD CER DIEL, 47PF, 10%, 75V	913-1098-020		72982	8111A075C0G0-470 K
C82,C83	CAPACITOR,FXD CER DIEL, 180PF, 2%, 75V	913-3872-800		93958	44696-9
C84-C87	CAPACITOR,FXD CER DIEL, 0.82UF, PORM10%, 50V	913-5019-550		81349	CK06BX824K
C88,C89	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
C90,C91	NOT USED				
C92	CAPACITOR,FXD TMTLM ELCTLT, 2.2UF, 20%, 25V	184-9102-660		56289	1990225X0025BE3
L1	INDUCTOR,RF	240-0441-010		02113	242-0441-010
L2	COIL,RF 10000UH	240-2715-610		96906	HS75089-35
L3,L4	COIL,RF 12000UH	240-2715-620		96906	HS75089-36
L5	INDUCTOR,RF	240-0441-010		02113	242-0441-010
L6,L7	COIL,RF 12000UH	240-2715-620		96906	HS75089-36
L8	INDUCTOR,RF	240-0441-010		02113	242-0441-010
L9,L10	COIL,RF 10000UH	240-2715-610		96906	HS75089-35
L11,L12	COIL,RF 15000UH	240-2715-630		96906	HS75089-37
Q1	TRANSISTOR (ESDS)	352-0756-010		17856	2N4416
Q2-Q4	TRANSISTOR	352-0661-820		07263	2N2222A
Q5	TRANSISTOR (ESDS)	382-1893-010		02738	3N187
Q6	TRANSISTOR (ESDS)	352-0756-010		17856	2N4416
Q7	TRANSISTOR (ESDS)	382-1893-010		02738	3N187

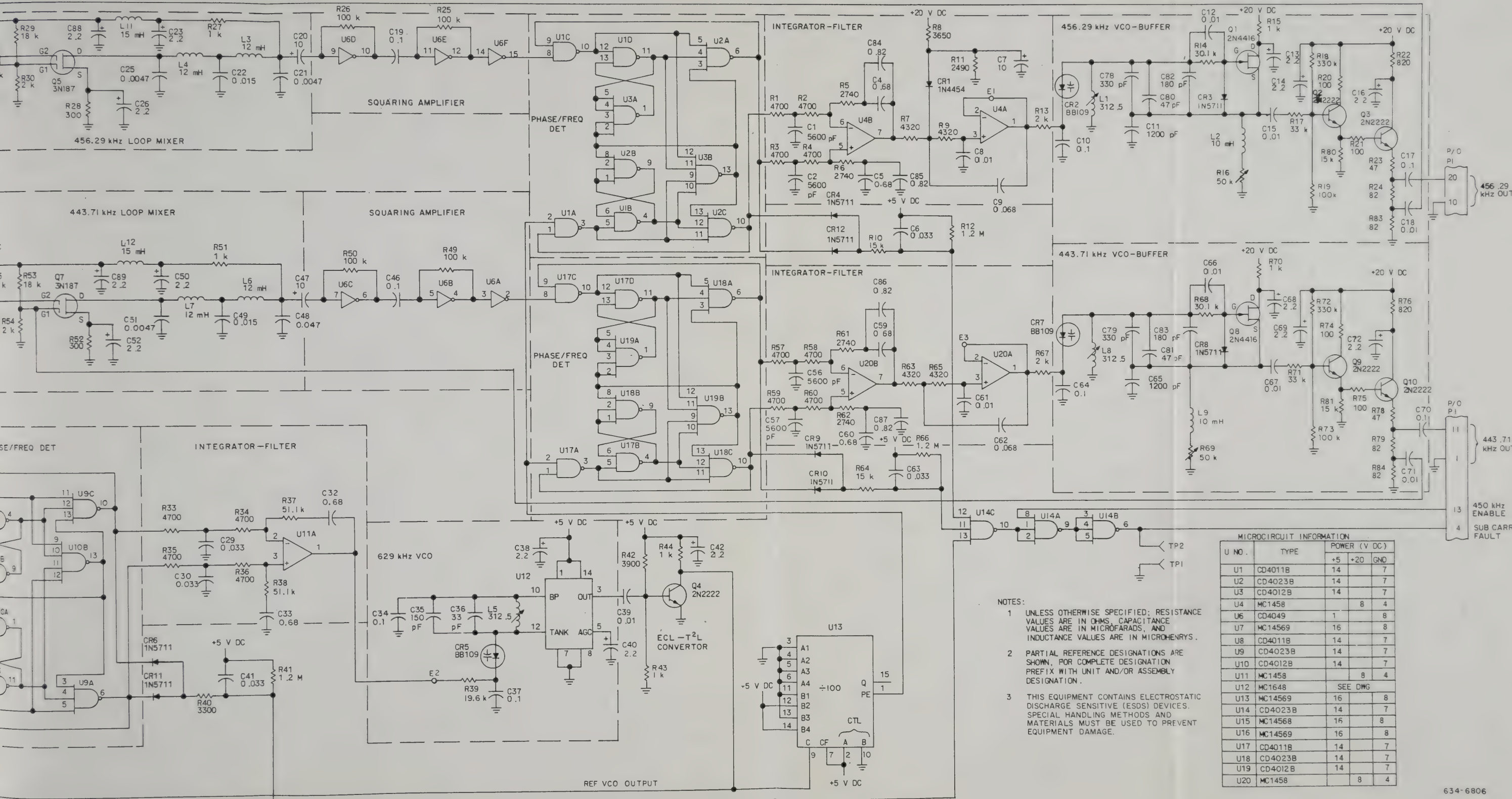
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
Q8	TRANSISTOR (ESDS)	352-0756-010		17856	2N4416
Q9,Q10	TRANSISTOR	352-0661-020		07263	2N2222A
R1-R4	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R5,R6	RESISTOR,FXD FILM, 2.74K, 1%, 1/8W	705-1017-000		81349	RN5504741F
R7	RESISTOR,FXD FILM, 4.32K, 1%, 1/8W	705-3605-300		81349	RN5504321F
R8	RESISTOR,FXD FILM, 3.65K, 1%, 1/8W	705-1023-000		81349	RN5503651F
R9	RESISTOR,FXD FILM, 4.32K, 1%, 1/8W	705-3605-300		81349	RN5504321F
R10	RESISTOR,FXD CHPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153KS
R11	RESISTOR,FXD FILM, 2.49K, 1%, 1/8W	705-1015-000		81349	RN5502491F
R12	RESISTOR,FXD CHPSN, 1.2MEGO, 5%, 1/8W	745-1864-270		81349	RCR05G125JS
R13	RESISTOR,FXD FILM, 2K, 1%, 1/8W	705-3605-140		81349	RN5502001F
R14	RESISTOR,FXD FILM, 30.1K, 1%, 1/8W	705-1067-000		81349	RN5503012F
R15	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN5501001F
R16	RESISTOR,VAR 50K, 5%, 1/2W	381-1770-000		80294	3290W1-503
R17	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R18	RESISTOR,FXD CHPSN, 330K, 10%, 1/8W	745-2431-000		81349	RCR05G334KS
R19	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R20,R21	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101KS
R22	RESISTOR,FXD CHPSN, 820 OHMS, 10%, 1/4W	745-0746-000		81349	RCR076821KS
R23	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/8W	745-2292-000		81349	RCR05G470KS
R24	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/8W	745-2301-000		81349	RCR05G820KS
R25,R26	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R27	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R28	RESISTOR,FXD CHPSN, 300 OHMS, 5%, 1/8W	745-1863-360		81349	RCR05G301JS
R29	RESISTOR,FXD CHPSN, 18K, 10%, 1/8W	745-2386-000		81349	RCR05G183KS
R30	RESISTOR,FXD CHPSN, 2K, 5%, 1/8W	745-1863-560		81349	RCR05G202JS
R31	RESISTOR,FXD CHPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473KS
R32	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R33-R36	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R37,R38	RESISTOR,FXD FILM, 51.1K, 1%, 1/8W	705-1078-000		81349	RN5505112F
R39	RESISTOR,FXD FILM, 19.6K, 1%, 1/8W	705-1058-000		81349	RN5501962F
R40	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/8W	745-2359-000		81349	RCR05G332KS
R41	RESISTOR,FXD CHPSN, 1.2MEGO, 5%, 1/8W	745-1864-270		81349	RCR05G125JS
R42	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/8W	745-2362-000		81349	RCR05G392KS
R43,R44	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R45	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/8W	745-2359-000		81349	RCR05G332KS
R46	RESISTOR,FXD CHPSN, 750 OHMS, 5%, 1/8W	745-1863-460		81349	RCR05G751JS
R47	RESISTOR,FXD CHPSN, 10MEGO, 10%, 1/8W	745-1864-850		81349	RCR05G106KS
R48	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/8W	745-2449-000		81349	RCR05G105KS
R49,R50	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R51	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R52	RESISTOR,FXD CHPSN, 300 OHMS, 5%, 1/8W	745-1863-360		81349	RCR05G301JS
R53	RESISTOR,FXD CHPSN, 18K, 10%, 1/8W	745-2386-000		81349	RCR05G183KS
R54	RESISTOR,FXD CHPSN, 2K, 5%, 1/8W	745-1863-560		81349	RCR05G202JS
R55	RESISTOR,FXD CHPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473KS
R56	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R57-R60	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R61,R62	RESISTOR,FXD FILM, 2.74K, 1%, 1/8W	705-1017-000		81349	RN5502741F
R63	RESISTOR,FXD FILM, 4.32K, 1%, 1/8W	705-3605-300		81349	RN5504321F
R64	RESISTOR,FXD CHPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153KS
R65	RESISTOR,FXD FILM, 4.32K, 1%, 1/8W	705-3605-300		81349	RN5504321F
R66	RESISTOR,FXD CHPSN, 1.2MEGO, 5%, 1/8W	745-1864-270		81349	RCR05G125JS
R67	RESISTOR,FXD FILM, 2K, 1%, 1/8W	705-3605-140		81349	RN5502001F
R68	RESISTOR,FXD FILM, 30.1K, 1%, 1/8W	705-1067-000		81349	RN5503012F
R69	RESISTOR,VAR 50K, 5%, 1/2W	381-1770-000		80294	3290W1-503
R70	RESISTOR,FXD FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN5501001F
R71	RESISTOR,FXD CHPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R72	RESISTOR,FXD CHPSN, 330K, 10%, 1/8W	745-2431-000		81349	RCR05G334KS
R73	RESISTOR,FXD CHPSN, 100K, 10%, 1/8W	745-2413-000		81349	RCR05G104KS
R74,R75	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101KS
R76	RESISTOR,FXD CHPSN, 820 OHMS, 10%, 1/4W	745-0746-000		81349	RCR076821KS
R77	NOT USED				
R78	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/8W	745-2292-000		81349	RCR05G470KS
R79	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/8W	745-2301-000		81349	RCR05G820KS
R80,R81	RESISTOR,FXD CHPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153KS
R82	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R83,R84	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/8W	745-2301-000		81349	RCR05G820KS
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
U1	INTEGRATED CIRCUIT (ESDS)	351-8159-340		07263	4011BPC
U2	INTEGRATED CIRCUIT (ESDS)	351-8159-360		07263	4023BPC
U3	INTEGRATED CIRCUIT (ESDS)	351-8159-350		07263	4012BPC
U4	INTEGRATED CIRCUIT OPNL AMPLIFIER	351-1071-070		07263	UA1458TC
U5	NOT USED				
U6	INTEGRATED CIRCUIT (ESDS)	351-8159-210		07263	F4049BPC
U7	MICROCIRCUIT (ESDS)	351-8882-010		04713	MC14569BPC
U8	INTEGRATED CIRCUIT (ESDS)	351-8159-340		07263	4011BPC
U9	INTEGRATED CIRCUIT (ESDS)	351-8159-360		07263	4023BPC
U10	INTEGRATED CIRCUIT (ESDS)	351-8159-350		07263	4012BPC
U11	INTEGRATED CIRCUIT OPNL AMPLIFIER	351-1071-070		07263	UA1458TC
U12	INTEGRATED CIRCUIT	351-7768-010		04713	MC1648P
U13	MICROCIRCUIT (ESDS)	351-8882-010		04713	MC14569BPC
U14	INTEGRATED CIRCUIT (ESDS)	351-8159-360		07263	4023BPC
U15	INTEGRATED CKT (ESDS)	351-8883-010		04713	MC14568BPC
U16	MICROCIRCUIT (ESDS)	351-8882-010		04713	MC14569BPC
U17	INTEGRATED CIRCUIT (ESDS)	351-8159-340		07263	4011BPC
U18	INTEGRATED CIRCUIT (ESDS)	351-8159-360		07263	4023BPC
U19	INTEGRATED CIRCUIT (ESDS)	351-8159-350		07263	4012BPC
U20	INTEGRATED CIRCUIT OPNL AMPLIFIER	351-1071-070		07263	UA1458TC



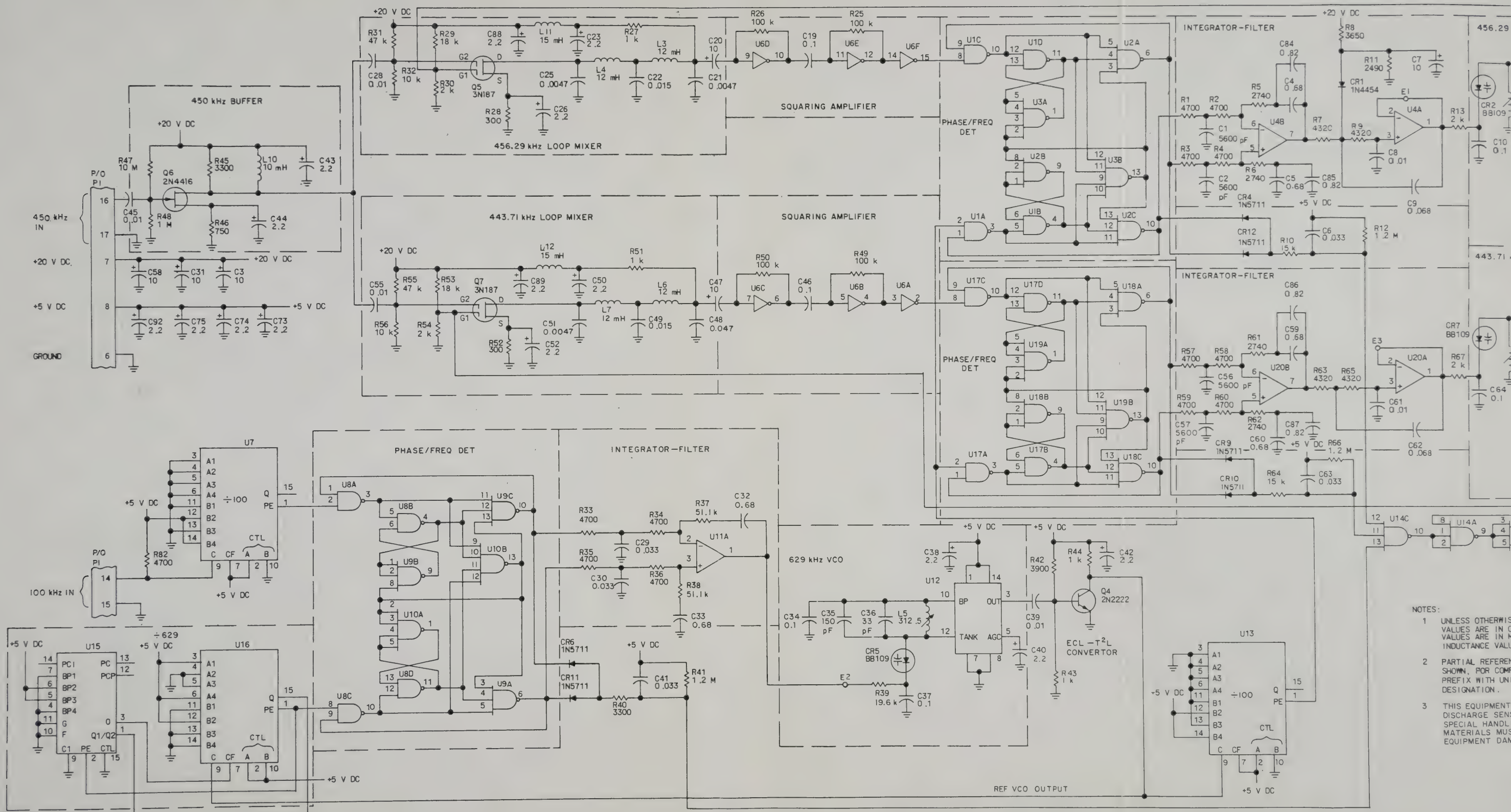
634-6806

Synthesizer Subcarrier Generator, Schematic Diagram
Figure 3 (Sheet 3)



634-6806

Synthesizer Subcarrier Generator, Schematic Diagram
Figure 3 (Sheet 3)



NOTES:

- 1 UNLESS OTHERWISE SPECIFIED, VALUES ARE IN Ω. VALUES ARE IN MΩ. INDUCTANCE VALUES ARE IN μH.
- 2 PARTIAL REFERENCES ARE SHOWN, FOR COMPONENTS. PREFIX WITH UNIT DESIGNATION.
- 3 THIS EQUIPMENT DISCHARGE SENSITIVE. SPECIAL HANDLING MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0770715-001211

1 January 1981

Synthesizer Reference
(642-2451-001)

Synthesizer Reference (642-2451-001)

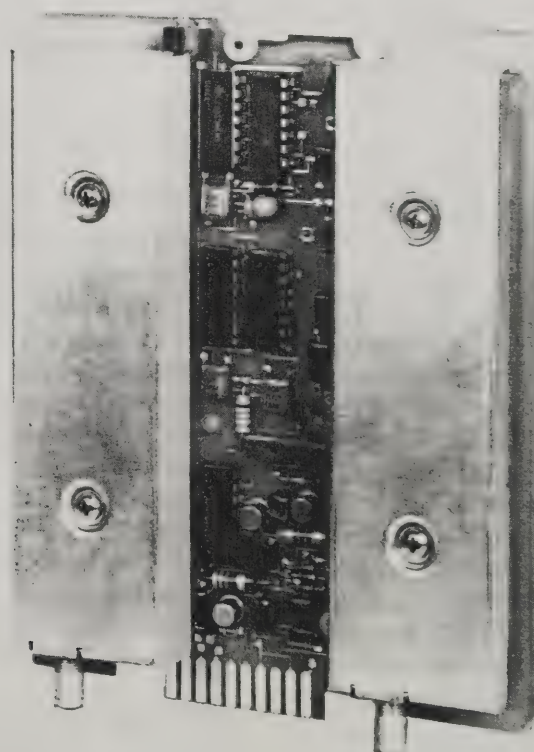
Printed in USA

1. DESCRIPTION

Synthesizer Reference 642-2451-001, shown in figure 1, contains a 3-layer planar card and two rf secure compartments (metal box construction) that contain two printed circuit cards. It has provisions for mounting an external phase-lock card that is used

with an external frequency standard. The 3-layer planar card has a 20-pin edge-on connector.

The synthesizer reference consists of temperature-compensated crystal oscillator (tcxo) A1, times 12 (x 12) multiplier A2, and reference divider A3. Provisions are provided for using an optional external phase-lock circuit card.



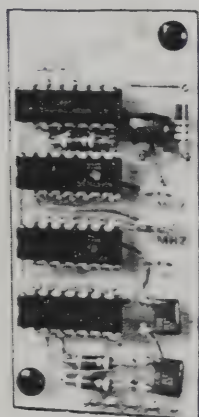
TPA-3028-017

Synthesizer Reference
Figure 1

523-0770715-001211

External Phase Lock 635-0655-001, shown in figure 2, is an optional printed circuit board that mounts to the synthesizer reference and allows an external frequency standard to be used. The external phase-lock card is a 2-layer circuit card that uses a 5-pin connector to mate with the synthesizer reference.

The external phase-lock card consists of a squaring amplifier, a divide-by-10 circuit, a divide-by-5 circuit, and a phase discriminator. Provisions are provided for using a 100-kHz, 1-MHz, or 5-MHz external frequency standard.



TP5-3193-017

External Phase Lock
Figure 2

2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 3.)

The synthesizer reference receives input voltages of +20 V dc and +5 V dc and a 450-kHz enable/disable signal. It generates a 9.9-MHz sine-wave output, a 118.8-MHz output, a 450-kHz output, and two 100-kHz reference signal outputs. The 9.9-MHz, 118.8-MHz, and 450-kHz outputs are used as injection inputs to the rf translator and its amplifiers, and the 100-kHz outputs are used as a reference for generating the variable injection frequencies. In addition, the 450-kHz is used by the synthesizer subcarrier generator as a reference signal. A performance monitor signal is also supplied to provide an indication of the operational status of the synthesizer reference. If the external phase-lock card is used, the synthesizer reference outputs are phase-locked to an external 100-kHz, 1-MHz, or 5-MHz frequency standard.

2.2 TCXO A1 (Refer to figure 3 and figure 4, the schematic diagram.)

The tcxo (Y1, Q1, Q2) is a voltage-controlled, temperature-compensated crystal oscillator. When used with its internal compensation circuit, RT1 through RT3 provide a temperature-compensated voltage control signal to the crystal oscillator. The crystal oscillator supplies a 9.9-MHz signal through one output amplifier (Q4) to the rf translator for fixed 9.9-MHz signal injection. The 9.9-MHz output signal is also routed to the performance monitor circuit. The crystal oscillator supplies the 9.9-MHz signal through a second output amplifier (Q3) to an inverter (U4C).

The 9.9-MHz signal is received by divide-by-11 circuit reference divider A3 and through a second inverter (U4D) to the times 12 multiplier A2.

2.3 Times 12 Multiplier (Refer to figure 3 and figure 4, the schematic diagram.)

The 9.9-MHz-signal is received by the times 12 multiplier, multiplied and applied to crystal filter Y1 (118.8 MHz), and produces an output 12 times the frequency of the applied input. The 118.8-MHz output is supplied to the rf translator for fixed 118.8-MHz signal injection. The 118.8-MHz signal is also amplified by amplifier Q11 and Q12 and routed to the performance monitor circuit.

2.4 Reference Dividers (Refer to figure 3 and figure 4, the schematic diagram.)

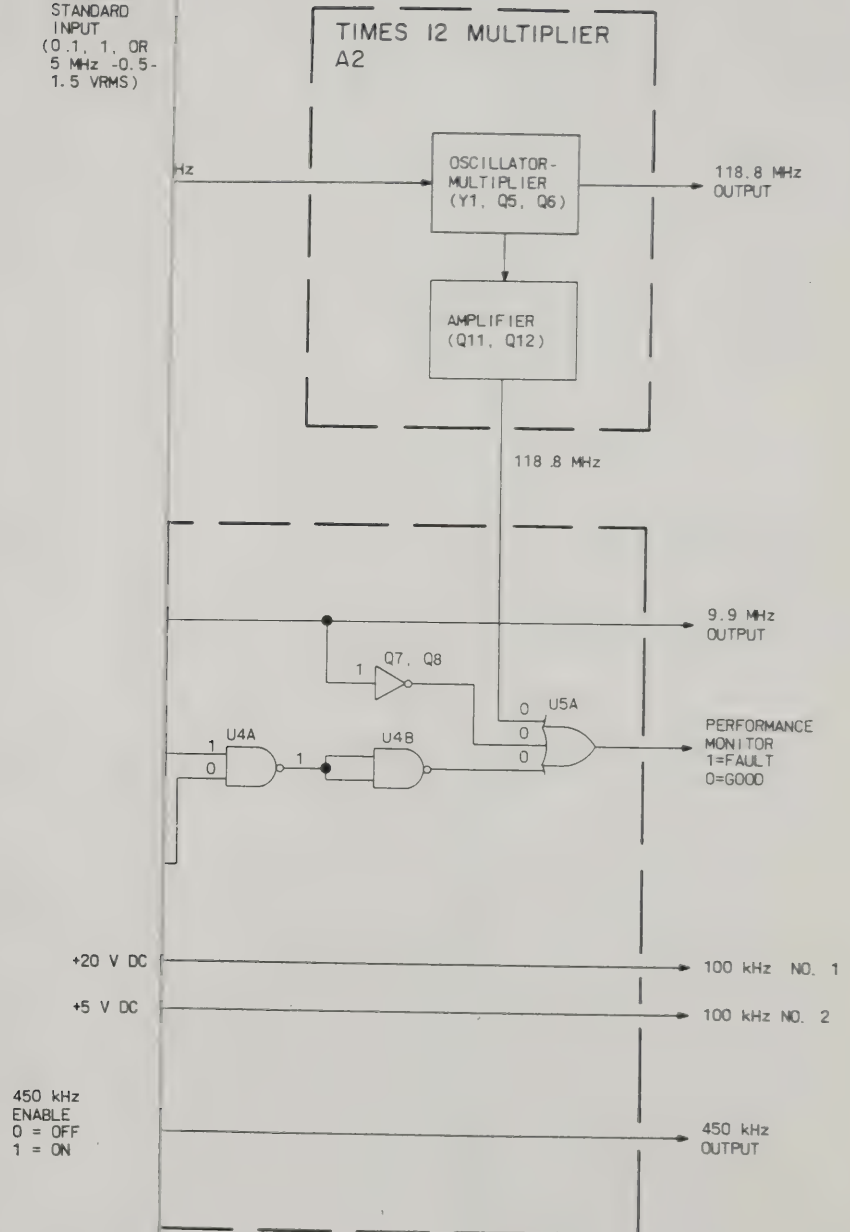
2.4.1 Divide-by-11

The 9.9-MHz signal is received by divide-by-11 circuit U1, divided (900 kHz), and applied to divide-by-9 U2 and divide-by-2 circuit U3A, B. The divide-by-11 circuit consists of an up/down decade counter and a D-type flip-flop. Refer to table 1 for the logic truth table of the divide-by-11 circuit. Note that when the ripple clock (RC) output resets the D-type flip-flop, it latches the reset condition until the ripple clock is removed (after the next clock input). This causes the decade counter to be loaded at counter 0 for the last half of clock 9, all of clock 10, and until after clock 11 is applied; then the load (L) logic 0 is removed. Clock 12 and clock 1 are one and the same, producing a divide-by-11 circuit.

2.4.2 Divide-by-9

The 900-kHz signal from divide-by-11 circuit U1 is received by divide-by-9 circuit U2, divided (100 kHz), and applied as two 100-kHz reference signals to the unit under control and to the external phase lock (if

EXTERNAL
FREQUENCY
STANDARD
INPUT
(0.1, 1, OR
5 MHz -0.5-
1.5 VRMS)

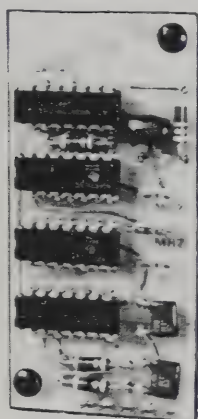


TPA-2499-014

Synthesizer Reference, Block Diagram
Figure 3

External Phase Lock 635-0655-001, shown in figure 2, is an optional printed circuit board that mounts to the synthesizer reference and allows an external frequency standard to be used. The external phase-lock card is a 2-layer circuit card that uses a 5-pin connector to mate with the synthesizer reference.

The external phase-lock card consists of a squaring amplifier, a divide-by-10 circuit, a divide-by-5 circuit, and a phase discriminator. Provisions are provided for using a 100-kHz, 1-MHz, or 5-MHz external frequency standard.



TP5-3193-017

External Phase Lock
Figure 2

2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 3.)

The synthesizer reference receives input voltages of +20 V dc and +5 V dc and a 450-kHz enable/disable signal. It generates a 9.9-MHz sine-wave output, a 118.8-MHz output, a 450-kHz output, and two 100-kHz reference signal outputs. The 9.9-MHz, 118.8-MHz, and 450-kHz outputs are used as injection inputs to the rf translator and its amplifiers, and the 100-kHz outputs are used as a reference for generating the variable injection frequencies. In addition, the 450-kHz is used by the synthesizer subcarrier generator as a reference signal. A performance monitor signal is also supplied to provide an indication of the operational status of the synthesizer reference. If the external phase-lock card is used, the synthesizer reference outputs are phase-locked to an external 100-kHz, 1-MHz, or 5-MHz frequency standard.

2.2 TCXO A1 (Refer to figure 3 and figure 4, the schematic diagram.)

The tcxo (Y1, Q1, Q2) is a voltage-controlled, temperature-compensated crystal oscillator. When used with its internal compensation circuit, RT1 through RT3 provide a temperature-compensated voltage control signal to the crystal oscillator. The crystal oscillator supplies a 9.9-MHz signal through one output amplifier (Q4) to the rf translator for fixed 9.9-MHz signal injection. The 9.9-MHz output signal is also routed to the performance monitor circuit. The crystal oscillator supplies the 9.9-MHz signal through a second output amplifier (Q3) to an inverter (U4C).

The 9.9-MHz signal is received by divide-by-11 circuit reference divider A3 and through a second inverter (U4D) to the times 12 multiplier A2.

2.3 Times 12 Multiplier (Refer to figure 3 and figure 4, the schematic diagram.)

The 9.9-MHz-signal is received by the times 12 multiplier, multiplied and applied to crystal filter Y1 (118.8 MHz), and produces an output 12 times the frequency of the applied input. The 118.8-MHz output is supplied to the rf translator for fixed 118.8-MHz signal injection. The 118.8-MHz signal is also amplified by amplifier Q11 and Q12 and routed to the performance monitor circuit.

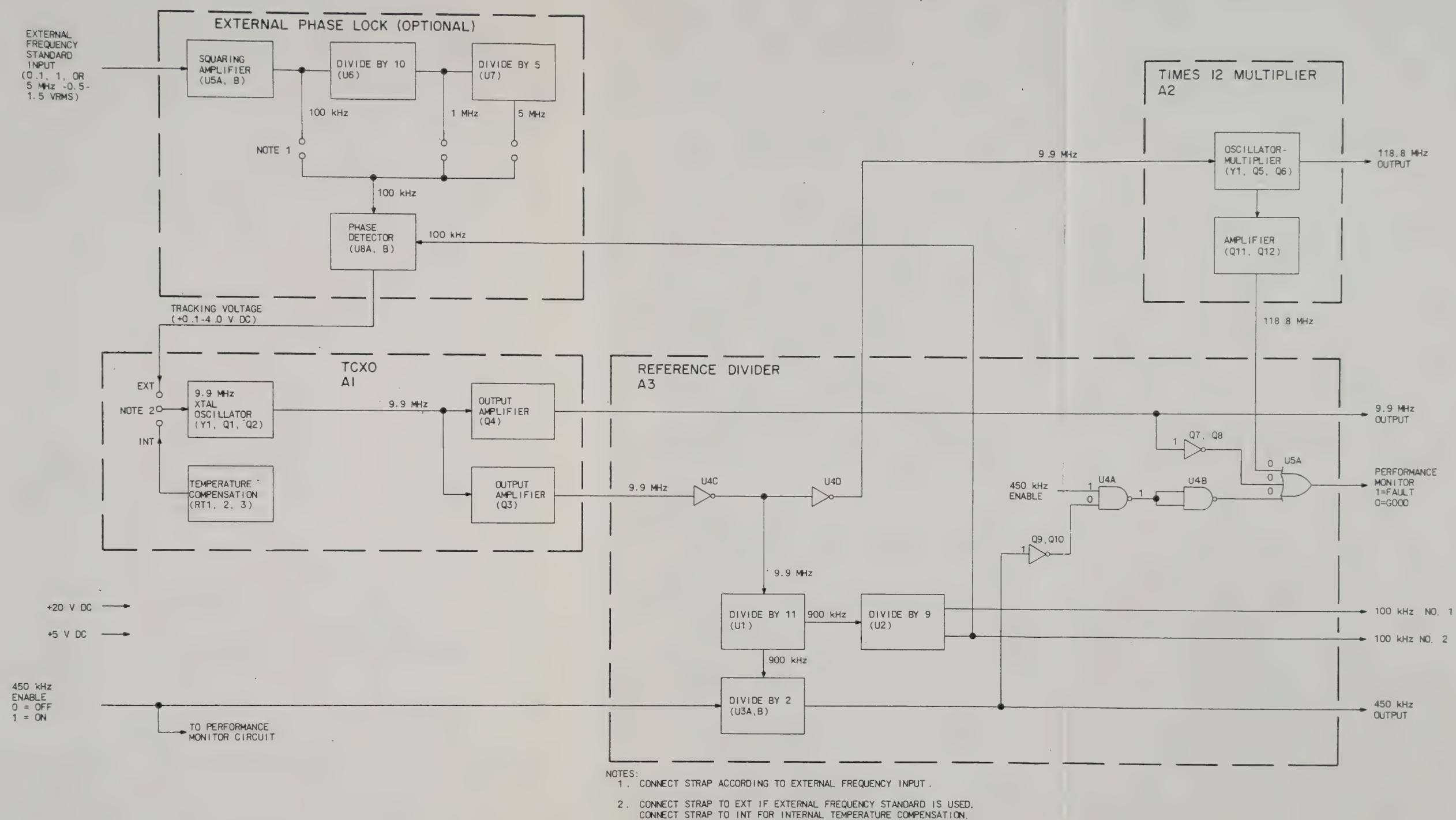
2.4 Reference Dividers (Refer to figure 3 and figure 4, the schematic diagram.)

2.4.1 Divide-by-11

The 9.9-MHz signal is received by divide-by-11 circuit U1, divided (900 kHz), and applied to divide-by-9 U2 and divide-by-2 circuit U3A, B. The divide-by-11 circuit consists of an up/down decade counter and a D-type flip-flop. Refer to table 1 for the logic truth table of the divide-by-11 circuit. Note that when the ripple clock (RC) output resets the D-type flip-flop, it latches the reset condition until the ripple clock is removed (after the next clock input). This causes the decade counter to be loaded at counter 0 for the last half of clock 9, all of clock 10, and until after clock 11 is applied; then the load (L) logic 0 is removed. Clock 12 and clock 1 are one and the same, producing a divide-by-11 circuit.

2.4.2 Divide-by-9

The 900-kHz signal from divide-by-11 circuit U1 is received by divide-by-9 circuit U2, divided (100 kHz), and applied as two 100-kHz reference signals to the unit under control and to the external phase lock (if



TPA-2499-014

Synthesizer Reference, Block Diagram
Figure 3

Table 1. Divide-by-11 Logic Truth Table.

CLOCK INPUT	U1						U3A				
	OUTPUTS						INPUTS			OUTPUTS	
	QA	QB	QC	QD	RC	COUNT	C	D	R	Q	$\bar{Q}$
1	1	0	0	0	1	1	1	1	1	1	0
2	0	1	0	0	1	2	2	1	1	1	0
3	1	1	0	0	1	3	3	1	1	1	0
4	0	0	1	0	1	4	4	1	1	1	0
5	1	0	1	0	1	5	5	1	1	1	0
6	0	1	1	0	1	6	6	1	1	1	0
7	1	1	1	0	1	7	7	1	1	1	0
8	0	0	0	1	1	8	8	1	1	1	0
9	1	0	0	1	1	9	9	1	1	1	0
9.5	0	0	0	0	*0	0	9.5	0	1	0	1
10	0	0	0	0	1	0	10	1	1	0	1
11	0	0	0	0	1	0	11	1	1	1	0
12/1	1	0	0	0	1	1	12/1	1	1	1	0

*RC logic 0 appears only for one-half clock cycle time and returns to logic 1 (U1 is reset to start count at 1).

used). The divide-by-9 circuit consists of an up/down decade counter. Refer to table 2 for a logic truth table of the divide-by-9 circuit. Note that the ripple clock (RC) output loads the decade counter to count 0 during the last half of clock 9 and allows the counter to count 1 at clock 10. Clock 10 and clock 1 are one and the same, producing a divide-by-9 circuit.

2.4.3 Divide-by-2

The 900-kHz signal from divide-by-11 circuit U1 is received by divide-by-2 circuit U3A, B, divided (450 kHz), and applied as a 450-kHz carrier reinsertion signal to the unit under control. The 450-kHz output signal is also routed to the performance monitor circuit and the synthesizer subcarrier. The divide-by-2 circuit consists of a D-type flip-flop. The 450-kHz enable signal is applied to pin 10 of U3A. This signal is also routed to the performance monitor circuit. Refer to table 3 for a logic truth table of the divide-by-2 circuit. Note that a logic 0 on the set input disables the divide-by-2 circuit (latches it in the set condition).

Table 2. Divide-by-9 Logic Truth Table.

CLOCK	U2					
	OUTPUTS					
	QA	QB	QC	QD	RC	COUNT
1	1	0	0	0	1	1
2	0	1	0	0	1	2
3	1	1	0	0	1	3
4	0	0	1	0	1	4
5	1	0	1	0	1	5
6	0	1	1	0	1	6
7	1	1	1	0	1	7
8	0	0	0	1	1	8
9	1	0	0	1	1	9
9.5	0	0	0	0	*0	0
10/1	1	0	0	0	1	1

*RC logic 0 appears only for one-half clock cycle time and returns to logic 1 (U1 is reset to start count at 1).

Table 3. Divide-by-2 Logic Truth Table.

INPUTS			OUTPUTS	
Clock	D	S	Q	$\overline{Q}$
→ 1	0	1	0	1
No change	1	1	No change	
→ 1	1	1	1	0
No change	0	1	No change	
→ 1	0	1	0	1
X	X	0	1	0
→ 1 = change from logic 0 to logic 1 1 = logic 1 0 = logic 0 X = no effect				

2.5 Performance Monitor Circuit (Refer to figure 3 and figure 4, the schematic diagram.)

The performance monitor circuit is located on reference divider A3. It consists of transistor amplifiers Q7 through Q10, NAND gates U4A and U4B, and OR gate U5A. This circuit monitors the presence of the 118.8 MHz-, 9.9 MHz-, and 450-kHz output signals, and the 450 kHz-enable signal.

The 450-kHz output and 450-kHz enable signal are applied to NAND gate U4A. If both signals are present, the NAND gate produces a logic 1 output. This is inverted and appears as a logic 0 at one input of OR gate U5A.

The 9.9 MHz-output signal is amplified and inverted by amplifiers Q7 and Q8. If this signal is present, a logic 0 signal is routed to one input of OR gate U5A.

The 118.8-MHz output signal is routed to one input of OR gate U5A. If this signal is present, a logic 0 is applied.

When all input signals are present, a logic 0 is applied to all inputs of OR gate U5A. Under these conditions, the output signal is a logic 0. This indicates a good synthesizer reference circuit card. If any one of the input signals are not present, the output of OR gate U5A is a logic 1. This indicates a fault in the synthesizer reference.

2.6 External Phase Lock (Refer to figure 3 and figure 4, the schematic diagram.)

The external phase lock receives an external frequency standard signal (5 MHz, 1 MHz, or 100 kHz)

and a txco 100-kHz reference signal for use in generation of a tracking voltage output for control of the synthesizer reference txco. The external phase lock must be internally strapped for the appropriate external frequency standard.

2.6.1 100-kHz External Standard

When a 100-kHz external standard is used, it is supplied through squaring amplifier U5A, B to phase detector U8A, B. A 100-kHz internal reference standard is also applied to the phase detector. The 100-kHz signals are phase compared and a resultant txco dc input signal is supplied by the external phase lock.

2.6.2 1-MHz External Standard

When a 1-MHz external standard is used, it is supplied through squaring amplifier U5A, B to divide-by-10 circuit U6. The 100-kHz output of the divide-by-10 circuit is supplied as a 100-kHz external standard to the phase detector. Refer to paragraph 2.6.1 for operating using the 100-kHz external standard.

2.6.3 5-MHz External Standard

When a 5-MHz external standard is used, it is supplied through squaring amplifier U5A, B to divide-by-10 circuit U6. The 500-kHz output of the divide-by-10 circuit is supplied to divide-by-5 circuit U7, and the 100-kHz output of the divide-by-5 circuit is supplied as a 100-kHz external standard to the phase detector. Refer to paragraph 2.6.1 for operation using the 100-kHz external standard.

3. TESTING AND TROUBLESHOOTING

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the synthesizer reference are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 4 check the total performance of the synthesizer reference. The test procedures in table 5 check the total performance of the external phase lock. These procedures permit isolation of a fault to a specific component or circuit when the results are used with the appropriate schematic diagram to trace the source of the fault.

Table 4. Synthesizer Reference Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Test Setup	a. Remove top cover of the unit containing the synthesizer reference that is to be tested. b. Remove cover from the synthesizer section of the unit. c. Remove synthesizer reference and install it on an extender card and place it in the unit. d. Set LINE SELECTOR switch to 115 V. e. Connect unit to 115-V ac power source and set power on. Note Refer to the parts location diagram for location of test points and adjustments. f. Measure dc voltage from J1-14 and J1-4 to J1-9 (ground). g. Measure dc voltage from J1-12 to J1-9 (ground). h. Set unit MODE switch to ISB.	+5.2 $\pm$ 0.2 V dc. NLT +19.5 V dc, NMT +20.8 V dc.	Check unit synthesizer voltage regulator. Check unit synthesizer voltage regulator.
2. 9.9-MHz output	a. Using an rf voltmeter with a 50-ohm adapter, measure the output at P53.	300 $\pm$ 75 mV rms.	Adjust A1R20 for 300-mV rms output. Check that tcxo is strapped to INT. If the above does not correct the results, replace tcxo A1.
3. 100-kHz reference outputs	a. Using a frequency counter, measure the output between J1-17 and J1-18 (ground). b. Using an oscilloscope, check the square-wave outputs of J1-17 and J1-18 (ground). c. Using a frequency counter, measure the output between J1-15 and J1-18 (ground). d. Using an oscilloscope, check the square-wave outputs at J1-15 and J1-18 (ground).	100 $\pm$ 0.1 kHz. Negative swing (logic 0) is NMT 0.5 V dc. Positive swing (logic 1) is NLT +3.0 V dc. 100 $\pm$ 0.1 kHz. Negative swing (logic 0) is NMT 0.5 V dc. Positive swing (logic 1) is NLT +3.0 V dc.	Check A3U4C, A3U3A, B, A3U1 and A3U2. Same as test 3.a. Same as test 3.a. Same as test 3.a.

Table 4. Synthesizer Reference Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. 450-kHz output	a. Using an rf voltmeter with a 50-ohm adapter, measure the output between J1-6 and J1-7 (ground). b. Set unit MODE switch to AM. c. Note the output between J1-6 and J1-7 (ground). d. Set MODE switch to ISB. e. Using a frequency counter, measure the output between J1-6 and J1-7 (ground).	300 $\pm$ 15 mV rms. $\cong$ 0 mV rms. 450 $\pm$ 0.5 kHz.	If indication is near normal limit, change value of A3R29. Check A3U3A, A3U3B, and associated circuit. Check A3U3B, A3U3A, and unit 450-kHz disable circuit. Check A3U3A, A3U3B, and associated circuit.
5. 118.8-MHz output	a. Remove shield that covers crystal A2Y1. b. Using an rf voltmeter with an unloaded probe tip, measure the rf voltage at A2Y1 output. c. Adjust A2C24 and A2C28 for maximum output. d. Using an rf voltmeter with a 50-ohm adapter, measure the output at P52. e. Adjust A2C32, A2C24, and A2C28 for maximum output.	Note output. 500 $\pm$ 100 mV rms.	Check A2Q5, A2Y1, and associated circuit. Check A2Q6, and associated circuit.
6. 118.8-MHz performance monitor	a. Using a 50-ohm adapter, connect rf voltmeter to P52. Measure and note output level. b. Connect an oscilloscope to J1-20. c. Adjust A2C32 until a logic 1 is indicated on the oscilloscope. d. Note the output level on rf voltmeter. e. Readjust A2C32 for proper output level.	500 $\pm$ 100 mV. Logic 1. 75 - 250 mV. 500 $\pm$ 100 mV.	Proceed to test 6.b. Check A2Q11, A2Q12, A3U5A, and associated circuit. Same as test 6.c. Change x 12 multiplier A2.
7. 9.9-MHz performance monitor (Cont)	a. Using a 50-ohm adapter, connect rf voltmeter to P53. Measure and note output level. b. Connect oscilloscope to J1-20. c. Adjust A1R20 until a logic 1 is indicated on the oscilloscope.	300 $\pm$ 75 mV. Logic 1.	Proceed to test 7.b. Check A1Q4, A3Q7, A3Q8, and associated circuit.

Table 4. Synthesizer Reference Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7. (Cont)	d. Note the output level on rf voltmeter.	50 - 150 mV.	Same as test 7.c.
	e. Readjust A1R20 for proper output level.	300 $\pm$ 75 mV.	Replace txco A1.
8. 450-kHz performance monitor	a. Connect rf voltmeter across J1-6 (+) and J1-7 (-). Measure and note output level.	300 $\pm$ 15 mV.	Proceed to test 8.b.
	b. Connect oscilloscope to J1-20.		
	c. Set unit MODE switch to AM. Note waveform on oscilloscope.	Logic 1.	Check A3U4A-B, A3Q9, A3Q10, and associated circuit.
	d. Note output level on rf voltmeter.	Approximately 0 mV.	Same as test 7.c.
	e. Set unit MODE switch to ISB. Note output level on rf voltmeter.	300 $\pm$ 15 mV.	Replace reference divider A3.

Table 5. External Phase Lock, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Test Setup	a. Remove top cover of the unit containing the external phase lock that is to be tested. b. Remove cover from the synthesizer section of the unit. c. Remove synthesizer reference (with external phase lock) and install it on an extender card and place it in the unit. d. Set unit LINE SELECTOR switch to 115 V. e. Connect unit to 115-V ac power source and set power on. f. Measure dc voltage from external phase lock P1-4 to P1-2 (ground). Note Clip inside tcxo must be in the external position (refer to figure 5).	+5.2 $\pm$ 0.2 V dc.	Check unit synthesizer voltage regulator and associated synthesizer reference.
2. 5-MHz external reference	a. Set clip on the external phase lock to the 5-MHz position. b. Connect 5-MHz external standard (0.5 to 1.5 V rms) to EXT STD jack on unit. c. Connect an oscilloscope to U8-8 and observe square wave. d. Ground P1-5 and observe square wave at U8-8. e. Remove P1-5 ground and observe square wave at U8-8.	Steady duty ratio, indicating locked condition. Unsteady square wave. Steady duty ratio, indicating locked condition.	Check U5, U6, U7, and U8. Check U8. Check U5, U6, U7, and U8.
3. 1-MHz external reference	a. Set clip on the external phase lock to the 1-MHz position. b. Connect 1-MHz external standard (0.5 to 1.5 V rms) to EXT STD jack on unit. c. Connect an oscilloscope to U8-8 and observe square wave. d. Ground P1-5 and observe square wave at U8-8. e. Remove P1-5 ground and observe square wave at U8-8.	Steady duty ratio, indicating locked condition. Unsteady square wave. Steady duty ratio, indicating locked condition.	Check U5, U6, and U8. Check U8. Check U5, U6, and U8.

Table 5. External Phase Lock, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. 100-kHz external reference	a. Set clip on the external phase lock to the 100-kHz position. b. Connect 100-kHz external standard (0.5 to 1.5 V rms to EXT STD jack on unit. c. Connect an oscilloscope to U8-8 and observe square wave. d. Ground P1-5 and observe square wave at U8-8. e. Remove P1-5 ground and observe square wave at U8-8.	Steady duty ratio, indicating locked condition. Unsteady square wave. Steady duty ratio, indicating locked condition.	Check U5 and U8. Check U8. Check U5 and U8.

4. REPAIR

Repair of the synthesizer reference and external phase lock is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

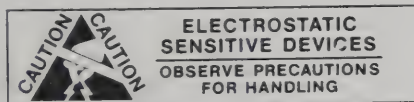
5. PARTS LIST/DIAGRAMS

5.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figures 4 and 5). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

5.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
00136	MCCOY ELECTRONICS CO WATTS AND CHESTNUT ST MT HOLLY SPRINGS PA 17065
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75222
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
07910	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV PO BOX 728 855 35TH STREET NE CEDAR RAPIDS IA 52406
14433	ITT SEMICONDUCTOR DIV WEST PALM BEACH FL
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054
18324	SIGNETICS CORP 811 E ARQUES SUNNYVALE CA 94086
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
34335	ADVANCED MICRO DEVICES 901 THOMPSON PL SUNNYVALE CA 94086
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
72982	ERIE TECHNOLOGICAL PRODUCTS INC 644 W 12TH ST ERIE PA 16512
73899	JFD ELECTRONICS COMPONENTS CORP 15TH AVENUE AND 62ND ST BROOKLYN NY 11219
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905

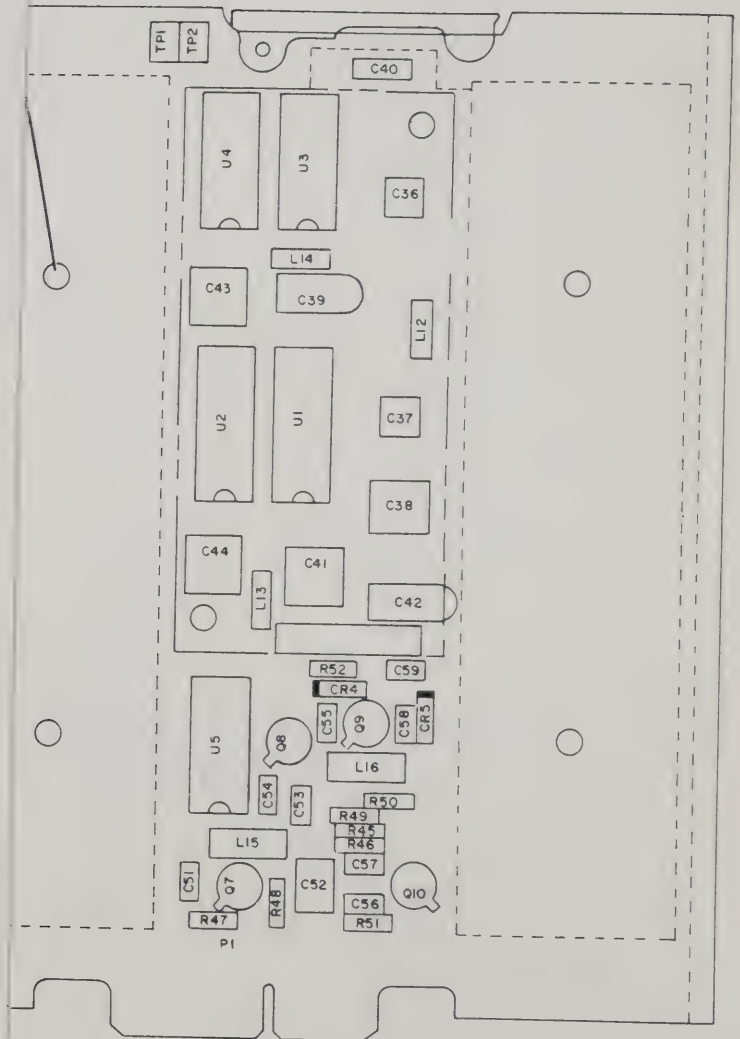
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
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80294	BOURNS INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
90634	GULTON INDUSTRIES INC GULTON ST METUCHEN NJ 08840
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
93958	REPUBLIC ELECTRONICS CORP 176 E 7TH ST PATERSON NJ 07524
96341	MICROWAVE ASSOCIATES INC NORTHWEST INDUSTRIAL PARK SOUTH AVE BURLINGTON MA 01803
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544

5.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

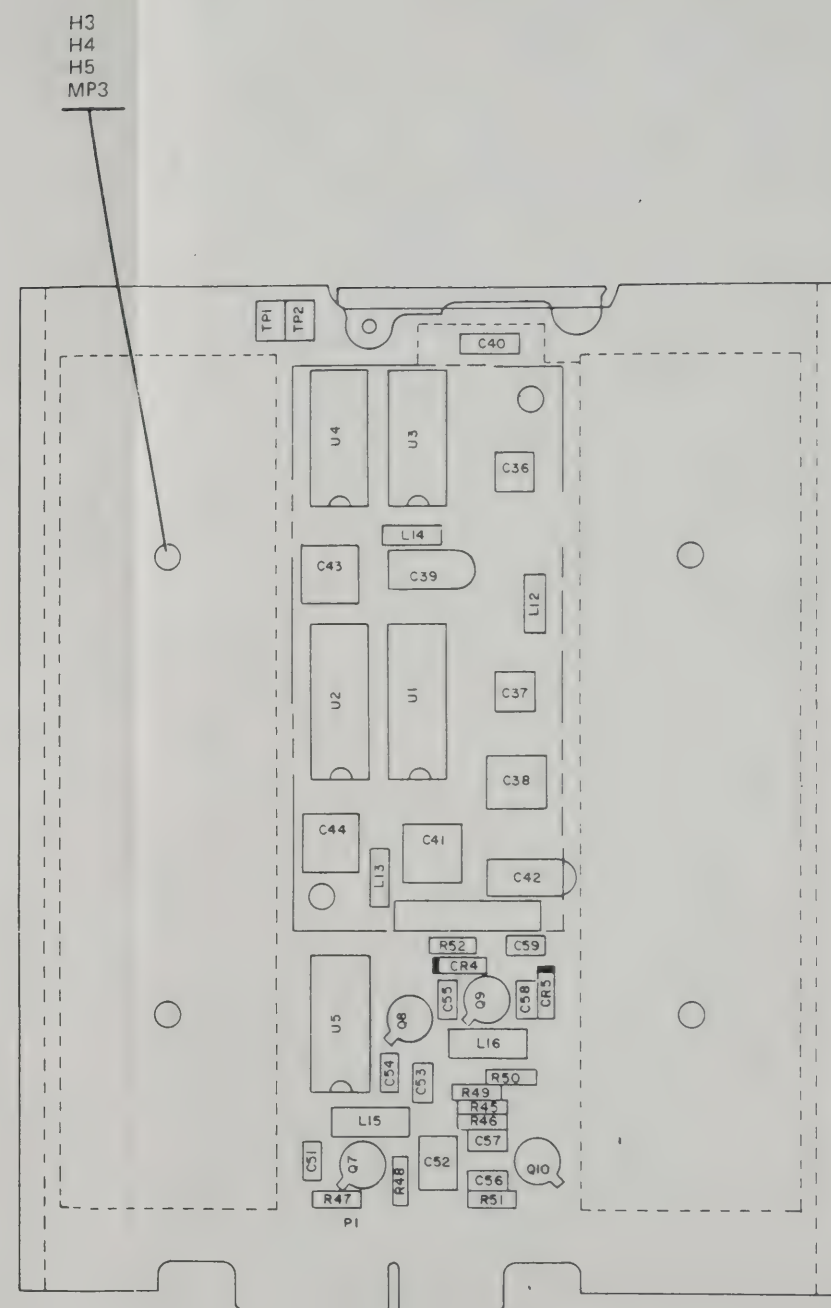
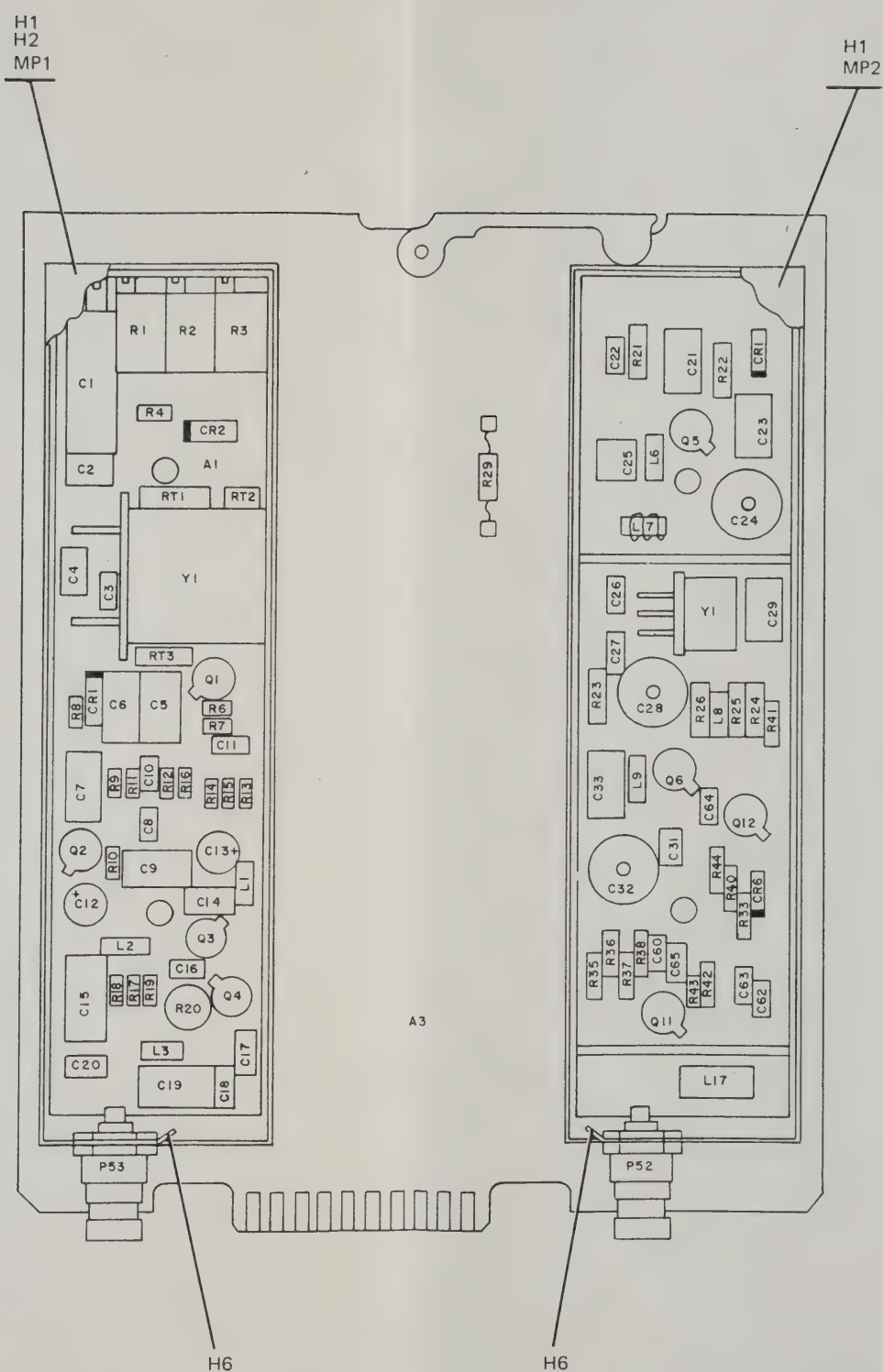
UNIT/SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Synthesizer reference	642-2451-001	REV B
Texo A1	635-0653-001	REV H
Times 12 multiplier A2	638-6594-001	REV A
Reference divider A3	635-6599-001	REV B
External Phase lock	635-0655-001	REV J



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2668-018

Synthesizer Reference, Schematic Diagram
Figure 4 (Sheet 1 of 3)



ELECTROSTATIC SENSITIVE DEVICES
OBSERVE PRECAUTIONS FOR HANDLING

TPA-2668-018

Synthesizer Reference, Schematic Diagram
Figure 4 (Sheet 1 of 3)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	SYNTHESIZER REFERENCE (ESDS)	642-2451-001					
A1	TCXO BOARD	635-0653-001		0-160		81349	CK05BX472K
A2	X12 MULTIPLEXER BOARD	638-6594-001		0-440		81349	CK06BX104K
A3	REFERENCE DIVIDER BOARD (ESDS)	638-6599-001		1-240		56289	199D106X0025CB1
H1	SCREW,MACH STL, 4-40 X 1/4 (QTY 4)	343-0133-000		96906	0-250	16546	CY30C474M
H2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 4)	310-0279-000		96906	0-040	56289	199D686X0006DB1
H3	NUT,PLAIN,HEX SST, 4-40 (QTY 4)	313-0043-000		96906	0-250	16546	CY30C474M
H4	WASHER,LOCK SST, 0.123 ID X 0.260 OD (QTY 4)	373-8010-000		96906			
H5	SCREW,MACH STL, 4-40 X 3/8 (QTY 4)	343-0135-000		96906	0-000	81349	CK05BX102K
H6	TERMINAL,LUG (QTY 4)	304-0220-000		77147	1-510	72136	DMSF391J050WV
MP1	COVER,BOX	635-4947-001			0-000	81349	CK05BX102K
MP2	COVER, BOX	635-4947-001			0-200	81349	CK05BX103K
MP3	POST,ELEC-MECH (QTY 4)	540-9036-003					
P52,P53	CONNECTOR,RCPT ELEC	357-7207-090		98291	0-000	96906	MS75084-17
	RESISTOR, TEST SELECT R29	635-8926-001			7-000	96906	MS75085-07
R29	RESISTOR,FXD CMPSN, 56 OHMS, 5%, 1/4W	745-0703-000		81349	0-110	96906	MS75087-11
R29	RESISTOR,FXD CMPSN, 62 OHMS, 5%, 1/4W	745-0705-000		81349	0-490	96906	MS75089-23
R29	RESISTOR,FXD CMPSN, 68 OHMS, 5%, 1/4W	745-0706-000		81349			
R29	RESISTOR,FXD CMPSN, 75 OHMS, 5%, 1/4W	745-0708-000		81349	0-010	17856	2N4416
R29	RESISTOR,FXD CMPSN, 82 OHMS, 5%, 1/4W	745-0709-000		81349	0-000	07910	2N918
R29	RESISTOR,FXD CMPSN, 91 OHMS, 5%, 1/4W	745-0711-000		81349	0-010	17856	2N4416
R29	RESISTOR,FXD CMPSN, 100 OHMS, 5%, 1/4W	745-0712-000		81349	0-000	07910	2N918
R29	RESISTOR,FXD CMPSN, 110 OHMS, 5%, 1/4W	745-0714-000		81349			
R29	RESISTOR,FXD CMPSN, 120 OHMS, 5%, 1/4W	745-0715-000		81349	0-000	81349	RCR05G101KS
R29	RESISTOR,FXD CMPSN, 130 OHMS, 5%, 1/4W	745-0717-000		81349	0-000	81349	RCR05G473KS
R29	RESISTOR,FXD CMPSN, 150 OHMS, 5%, 1/4W	745-0718-000		81349	0-000	81349	RCR05G102KS
R29	RESISTOR,FXD CMPSN, 160 OHMS, 5%, 1/4W	745-0720-000		81349	0-000	81349	RCR05G103KS
R29	RESISTOR,FXD CMPSN, 180 OHMS, 5%, 1/4W	745-0721-000		81349	0-000	81349	RCR05G101KS
	TCXO BOARD A1	635-0653-001			1-000	81349	RCR05G821KS
CR1	SEMICONV DEVICE	353-3157-000		81483	0-000	81349	RCR05G473KS
CR2	SEMICONV DEVICE	922-6095-160		96341	0-070	74970	105-1108-011
C1	CAPACITOR,VAR GL DIEL, 0.8 TO 12PF, 750V	922-0487-000		73899	0-020	74970	105-1102-011
C2	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	0-040	34335	SN74LS190N
	CAPACITOR, TEST SELECT C3	601-3486-001			0-010	04713	SN74LS190N
C3	CAPACITOR,FXD CER DIEL, 0.47PF, PORM 0.25PF, 75V	913-1098-320		72982	0-050	07263	7400PC
C3	CAPACITOR,FXD CER DIEL, 0.56PF, PORM 0.25PF, 75V	913-1098-310		72982		02735	CD4075BE
C3	CAPACITOR,FXD CER DIEL, 0.68PF, PORM 0.25PF, 75V	913-1098-300		72982			
C3	CAPACITOR,FXD CER DIEL, 0.82PF, PORM 0.25PF, 75V	913-1098-290		72982			
C3	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.25PF, 150V	913-1098-330		72982			
C3	CAPACITOR,FXD CER DIEL, 1.2PF, PORM 0.25PF, 75V	913-1098-280		72982			
C3	CAPACITOR,FXD CER DIEL, 1.8PF, PORM 0.25PF, 75V	913-1098-260		72982			
C3	CAPACITOR,FXD CER DIEL, 2.7PF, PORM 0.25PF, 75V	913-1098-240		72982			
C3	CAPACITOR,FXD CER DIEL, 3.9PF, PORM 0.25PF, 75V	913-1098-220		72982			
C3	CAPACITOR,FXD CER DIEL, 4.7PF, PORM 0.25PF, 75V	913-1098-210		72982			
C3	CAPACITOR,FXD CER DIEL, 6.8PF, PORM 0.5PF, 75V	913-1098-140		72982			
C3	CAPACITOR,FXD CER DIEL, 8.2PF, PORM 0.5PF, 75V	913-1098-160		72982			
C3	CAPACITOR,FXD CER DIEL, 10PF, 5%, 75V	913-1098-010		72982			
	CAPACITOR, TEST SELECT C4	601-3485-001					
C4	CAPACITOR,FXD MICA DIEL, 82PF, 5%, 50V	912-4141-350		93790			
C4	CAPACITOR,FXD MICA DIEL, 91PF, 5%, 50V	912-4141-360		93790			
C4	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 50V	912-4141-050		93790			
C4	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 50V	912-4141-370		93790			
C4	CAPACITOR,FXD MICA DIEL, 120PF, 5%, 50V	912-4141-380		93790			
C4	CAPACITOR,FXD MICA DIEL, 130PF, 5%, 50V	912-4141-390		93790			
C4	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V	912-4141-400		93790			
C4	CAPACITOR,FXD MICA DIEL, 160PF, 5%, 50V	912-4141-410		93790			
C4	CAPACITOR,FXD MICA DIEL, 170PF, 5%, 50V	912-4141-420		93790			
C4	CAPACITOR,FXD MICA DIEL, 180PF, 5%, 50V	912-4141-430		93790			
C4	CAPACITOR,FXD MICA DIEL, 200PF, 5%, 50V	912-4141-440		93790			
C4	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 50V	912-4141-450		93790			
C4	CAPACITOR,FXD MICA DIEL, 270PF, 5%, 50V	912-4141-470		93790			
C4	CAPACITOR,FXD MICA DIEL, 300PF, 5%, 50V	912-4141-480		93790			
C4	CAPACITOR,FXD MICA DIEL, 330PF, 5%, 50V	912-4141-490		93790			
C4	CAPACITOR,FXD MICA DIEL, 360PF, 5%, 50V	912-4141-500		93790			
C4	CAPACITOR,FXD MICA DIEL, 390PF, 5%, 50V	912-4141-510		72136			
C4	CAPACITOR,FXD MICA DIEL, 400PF, 5%, 50V	912-4141-520		72136			
C4	CAPACITOR,FXD CER DIEL, 0.00047UF, 5%, 100V	913-3117-080		56289			
C4	CAPACITOR,FXD CER DIEL, 0.00068UF, 5%, 100V	913-3117-090		56289			
C5,C6	CAPACITOR,FXD MICA DIEL, 220PF, 5%, 500V	912-3903-000		81349			
C7	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 500V	912-3879-000		81349			
C8	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349			
C9	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 500V	912-3856-000		81349			
C10,C11	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-010		81349			
C12	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289			

matic Diagram

2)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
A1	SYNTHESIZER REFERENCE (ESDS)	642-2451-001			
A2	TCXO BOARD	635-0653-001			
A3	X12 MULTIPLEXER BOARD	638-6594-001			
H1	REFERENCE DIVIDER BOARD (ESDS)	638-6599-001			
H2	SCREW,MACH STL, 4-40 X 1/4 (QTY 4)	343-0133-000			
H3	WASHER,LOCK SST, 0.115 ID X 0.209 OD (QTY 4)	310-0279-000		96906	MS51957-13
H4	NUT,PLAIN,HEX SST, 4-40 (QTY 4)	313-0043-000		96906	MS33538-135
H5	WASHER,LOCK SST, 0.123 ID X 0.260 OD (QTY 4)	373-8010-000		96906	MS3649-244
H6	SCREW,MACH STL, 4-40 X 3/8 (QTY 4)	343-0135-000		96906	MS53359-57
MP1	TERMINAL,LUG (QTY 4)	304-0220-000		96906	MS51957-15
MP2	COVER,BOX	635-4947-001		77147	4028HT
MP3	COVER, BOX	635-4947-001			
P52,P53	POST,ELEC-MECH (QTY 4)	540-9036-003			540-9036-003
	CONNECTOR,RCPT ELEC	357-7207-090		98291	52-044-0000
R29	RESISTOR, TEST SELECT R29	635-8926-001			
R29	RESISTOR,FXD CHPSN, 56 OHMS, 5%, 1/4W	745-0703-000		81349	RCR07G560JS
R29	RESISTOR,FXD CHPSN, 62 OHMS, 5%, 1/4W	745-0705-000		81349	RCR07G620JS
R29	RESISTOR,FXD CHPSN, 68 OHMS, 5%, 1/4W	745-0706-000		81349	RCR07G680JS
R29	RESISTOR,FXD CHPSN, 75 OHMS, 5%, 1/4W	745-0708-000		81349	RCR07G750JS
R29	RESISTOR,FXD CHPSN, 82 OHMS, 5%, 1/4W	745-0709-000		81349	RCR07G820JS
R29	RESISTOR,FXD CHPSN, 91 OHMS, 5%, 1/4W	745-0711-000		81349	RCR07G910JS
R29	RESISTOR,FXD CHPSN, 100 OHMS, 5%, 1/4W	745-0712-000		81349	RCR07G101JS
R29	RESISTOR,FXD CHPSN, 110 OHMS, 5%, 1/4W	745-0714-000		81349	RCR07G111JS
R29	RESISTOR,FXD CHPSN, 120 OHMS, 5%, 1/4W	745-0715-000		81349	RCR07G121JS
R29	RESISTOR,FXD CHPSN, 130 OHMS, 5%, 1/4W	745-0717-000		81349	RCR07G131JS
R29	RESISTOR,FXD CHPSN, 150 OHMS, 5%, 1/4W	745-0718-000		81349	RCR07G151JS
R29	RESISTOR,FXD CHPSN, 160 OHMS, 5%, 1/4W	745-0720-000		81349	RCR07G161JS
R29	RESISTOR,FXD CHPSN, 180 OHMS, 5%, 1/4W	745-0721-000		81349	RCR07G181JS
CR1	TCXO BOARD A1	635-0653-001			
CR2	SEMICOND DEVICE	353-3157-000		81483	1N935A
C1	SEMICOND DEVICE	922-6095-160		96341	1N5146A
C2	CAPACITOR,VAR GL DIEL, 0.8 TO 12PF, 750V	922-0487-700		73899	VC1L6WY
	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C3	CAPACITOR, TEST SELECT C3	601-3486-001			
C3	CAPACITOR,FXD CER DIEL, 0.47PF, PORM 0.25PF, 75V	913-1098-320		72982	8111B090C0K0-0-C
C3	CAPACITOR,FXD CER DIEL, 0.56PF, PORM 0.25PF, 75V	913-1098-310		72982	8111B090C0K0-5-C
C3	CAPACITOR,FXD CER DIEL, 0.68PF, PORM 0.25PF, 75V	913-1098-300		72982	8111B090C0K0-6-C
C3	CAPACITOR,FXD CER DIEL, 0.82PF, PORM 0.25PF, 75V	913-1098-290		72982	8111B090C0K08-C
C3	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.25PF, 150V	913-1098-330		72982	8110B121C0K0-1-C
C3	CAPACITOR,FXD CER DIEL, 1.2PF, PORM 0.25PF, 75V	913-1098-280		72982	8101A075C0K0-1-C
C3	CAPACITOR,FXD CER DIEL, 1.8PF, PORM 0.25PF, 75V	913-1098-260		72982	8101A075C0K0-1-C
C3	CAPACITOR,FXD CER DIEL, 2.7PF, PORM 0.25PF, 75V	913-1098-240		72982	8101B077C0G0-2-C
C3	CAPACITOR,FXD CER DIEL, 3.9PF, PORM 0.25PF, 75V	913-1098-220		72982	8101A075C0J0-3-C
C3	CAPACITOR,FXD CER DIEL, 4.7PF, PORM 0.25PF, 75V	913-1098-210		72982	8101A075C0H0-4-C
C3	CAPACITOR,FXD CER DIEL, 6.8PF, PORM 0.5PF, 75V	913-1098-140		72982	8101A075C0H0-6-B
C3	CAPACITOR,FXD CER DIEL, 8.2PF, PORM 0.5PF, 75V	913-1098-160		72982	8101A075C0H0-8-B
C3	CAPACITOR,FXD CER DIEL, 10PF, 5%, 75V	913-1098-010		72982	8101A075C0G0-1-J
C4	CAPACITOR, TEST SELECT C4	601-3485-001			
C4	CAPACITOR,FXD MICA DIEL, 82PF, 5%, 50V	912-4141-350		93790	CD5EY820J0
C4	CAPACITOR,FXD MICA DIEL, 91PF, 5%, 50V	912-4141-360		93790	CD5FY910J

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
C13	CAPACITOR,FXD TMTLM ELCTLT, 60UF, 20%, 6V	184-9102-040		56289	199D686X00060
C14	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C15	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 500V	912-3856-000		81349	CM04ED479J03
C16	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C17,C18	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C19	CAPACITOR,FXD MICA DIEL, 56PF, 5%, 500V	912-3861-000		81349	CM04ED560J03
C20	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
L1	COIL,RF 560UH	240-2723-050		96906	MS75085-16
L2	COIL,RF 1UH	240-2023-000		96906	MS75083-13
L3	COIL,RF 0.56UH	240-2020-000		96906	MS75083-10
Q1-Q3	TRANSISTOR	352-0596-030		14433	2N2369A
Q4	TRANSISTOR	352-0440-000		07910	2N918
RT1	RESISTOR,THRM 100K, 10%, 4MW	714-1138-010		90634	51TD49
RT2	RESISTOR,THRM 1K, 10%, 2.6MW	714-1138-060		90634	31TD43
RT3	RESISTOR,THRM 1MEGO, 5%, 5.3MW	714-2853-000		90634	61TH49-5PCT
R1	RESISTOR,VAR	380-9086-030		80294	3292X50K
R2	RESISTOR,VAR	380-9086-040		80294	3292X500K
R3	RESISTOR,VAR	380-9086-030		80294	3292X50K
R4	RESISTOR,FXD CMPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR056473KS
R5	NOT USED				
R6,R7	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R8	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R9,R10	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R11	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R12	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/8W	745-2347-000		81349	RCR05G152KS
R13,R14	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R15	RESISTOR,FXD CMPSN, 560 OHMS, 10%, 1/8W	745-2332-000		81349	RCR05G561KS
R16	RESISTOR,FXD 383 OHMS, 1%, 1W	747-2183-570		81349	RWR81S3830FR
R17	RESISTOR,FXD CMPSN, 12K, 10%, 1/8W	745-2380-000		81349	RCR05G123KS
R18	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R19	RESISTOR,FXD CMPSN, 270 OHMS, 10%, 1/8W	745-2320-000		81349	RCR05G271KS
R20	RESISTOR,VAR 200 OHMS, 10%, 0.5W	382-0027-050		80294	3329HCT1-201
Y1	CRYSTAL UNIT,QTZ 9.900000MHZ	289-7271-010		00136	289-7271-010
CR1	X12 MULTIPLEXER BOARD A2	638-6594-001			
CR2-CR5	SEMICOND DEVICE	353-3644-010		03508	1N4454GE
CR6	NOT USED				
CR6	SEMICOND DEVICE	353-3644-010		03508	1N4454GE
C1-C20	NOT USED				
C21	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 500V	912-3844-000		81349	CM04ED270J03
C22	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C23	CAPACITOR,FXD CER DIEL, 120PF, 2%, 75V	913-3379-000		93958	44696-16
C24	CAPACITOR,VAR CER DIEL, 2 TO 8PF, 350V	917-1218-000		72982	538011COP089R
C25	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	199D106X0025CB
C26,C27	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C28	CAPACITOR,VAR CER DIEL, 2 TO 8PF, 350V	917-1218-000		72982	538011COP069R
C29	CAPACITOR,FXD MICA DIEL, 24PF, 5%, 500V	912-3843-000		81349	CM04ED240J03
C30	NOT USED				
C31	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
C32	CAPACITOR,VAR CER DIEL, 2 TO 8PF, 350V	917-1218-000		72982	538011COP089R
C33	CAPACITOR,FXD MICA DIEL, 30PF, 5%, 500V	912-3846-000		81349	CM04ED300J03
C34-C59	NOT USED				
C60	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K

PARTS LIST (Cont)

REF	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
C1-C35	NOT USED				
C36,C37	CAPACITOR,FXD CER DIEL, 4700PF, PORM10%, 100V	913-5019-160		81349	CK05BX472K
C38	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C39	CAPACITOR,FXD TINTLM ELCTLT, 100F, 20%, 25V	184-9102-240		56289	1990106X0025C
C40,C41	CAPACITOR,FXD CER DIEL, 0.47UF, 20%, 50V	913-3275-250		16546	CY30C474M
C42	CAPACITOR,FXD TINTLM ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	1990666X0006D
C43,C44	CAPACITOR,FXD CER DIEL, 0.47UF, 20%, 50V	913-3275-250		16546	CY30C474M
C45-C50	NOT USED				
C51	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4016-000		81349	CK05BX102K
C52	CAPACITOR,FXD MICA DIEL, 390PF, 5%, 50V	912-4141-510		72136	OM5F391J050VH
C53	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4016-000		81349	CK05BX102K
C54-C59	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
L1-L11	NOT USED				
L12,L13	COIL,RF 27UH	240-2040-000		96906	MS75084-17
L14	COIL,RF 100UH	240-2047-000		96906	MS75085-07
L15	COIL,RF 0.68UH	240-2715-110		96905	MS75087-11
L16	COIL,RF 1000UH	240-2715-490		96906	MS75089-23
Q1-Q6	NOT USED				
Q7	TRANSISTOR (ESDS)	352-0756-010		17856	2N4416
Q8	TRANSISTOR	352-0440-000		07910	2N918
Q9	TRANSISTOR (ESDS)	352-0756-010		17856	2N4416
Q10	TRANSISTOR	352-0440-000		07910	2N918
R1-R44	NOT USED				
R45	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101K5
R46	RESISTOR,FXD CMPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473K5
R47	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102K5
R48	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103K5
R49	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101K5
R50	RESISTOR,FXD CMPSN, 820 OHMS, 10%, 1/8W	745-2333-000		81349	RCR05G821K5
R51	RESISTOR,FXD CMPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473K5
R52	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103K5
TP1	JACK,TIP BRN	360-0484-070		74970	105-1108-011
TP2	JACK,TIP RED	360-0484-020		74970	105-1102-011
U1,U2	INTEGRATED CIRCUIT COUNTER	351-1527-040		34335	SN74LS190N
U3	INTEGRATED CIRCUIT FLIP FLOP	351-1525-040		04713	SN74LS74AN
U4	INTEGRATED CIRCUIT LOGIC GATE	351-7627-010		07263	7400PC
U5	INTEGRATED CIRCUIT MOS GATE (ESDS)	351-8287-050		02735	CD4075BE

MICROCIRCUIT INFORMATION

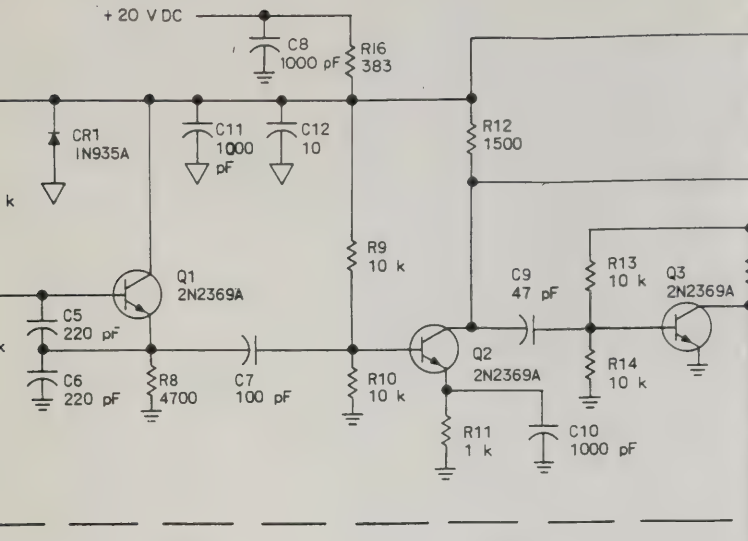
U NO	TYPE	PMR (V DC)	
		+5	GND
U1	74LS190	16	8
U2	74LS190	16	8
U3	74LS74	14	7
U4	7400	14	7
U5	4075	14	7

ALL DIMENSIONAL VALUES ARE IN INCHES, MILLIMETERS, MICROFARADS AND HENRYS.

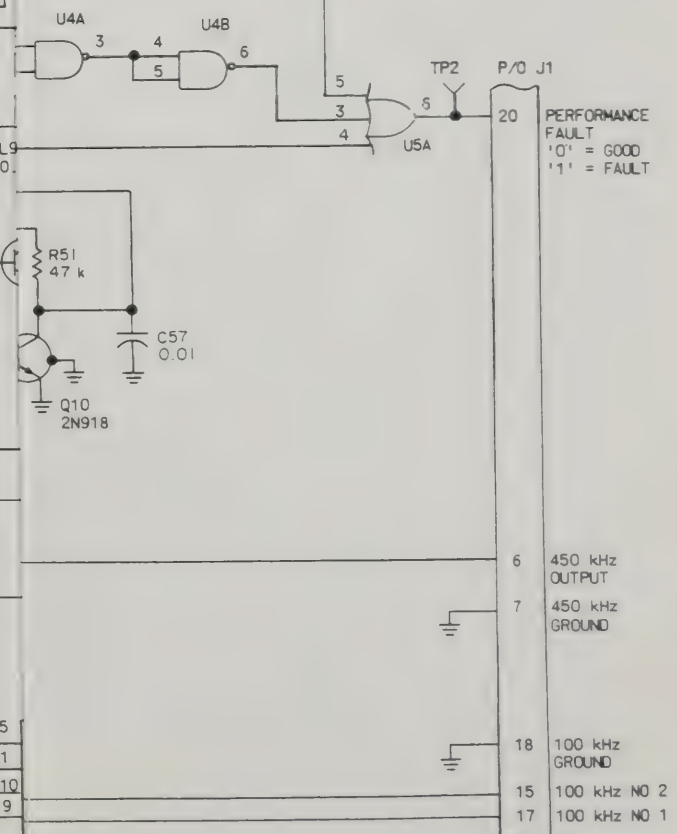
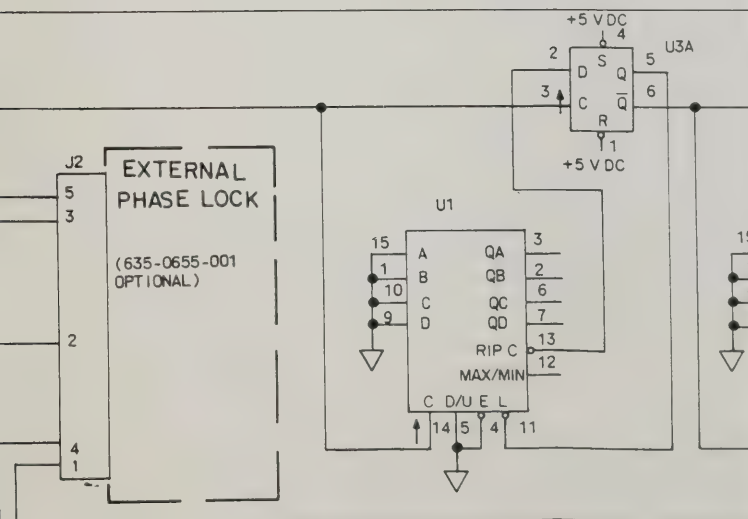
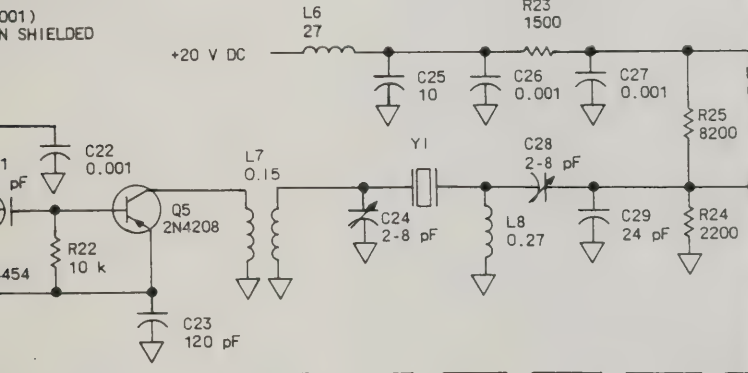
ALL DIMENSIONAL VALUES ARE SHOWN; FOR COMPLETE NUMBER AND/OR

NOMINAL VALUE SHOWN.

STATIC DISCHARGE HANDLING METHODS TO PREVENT EQUIPMENT

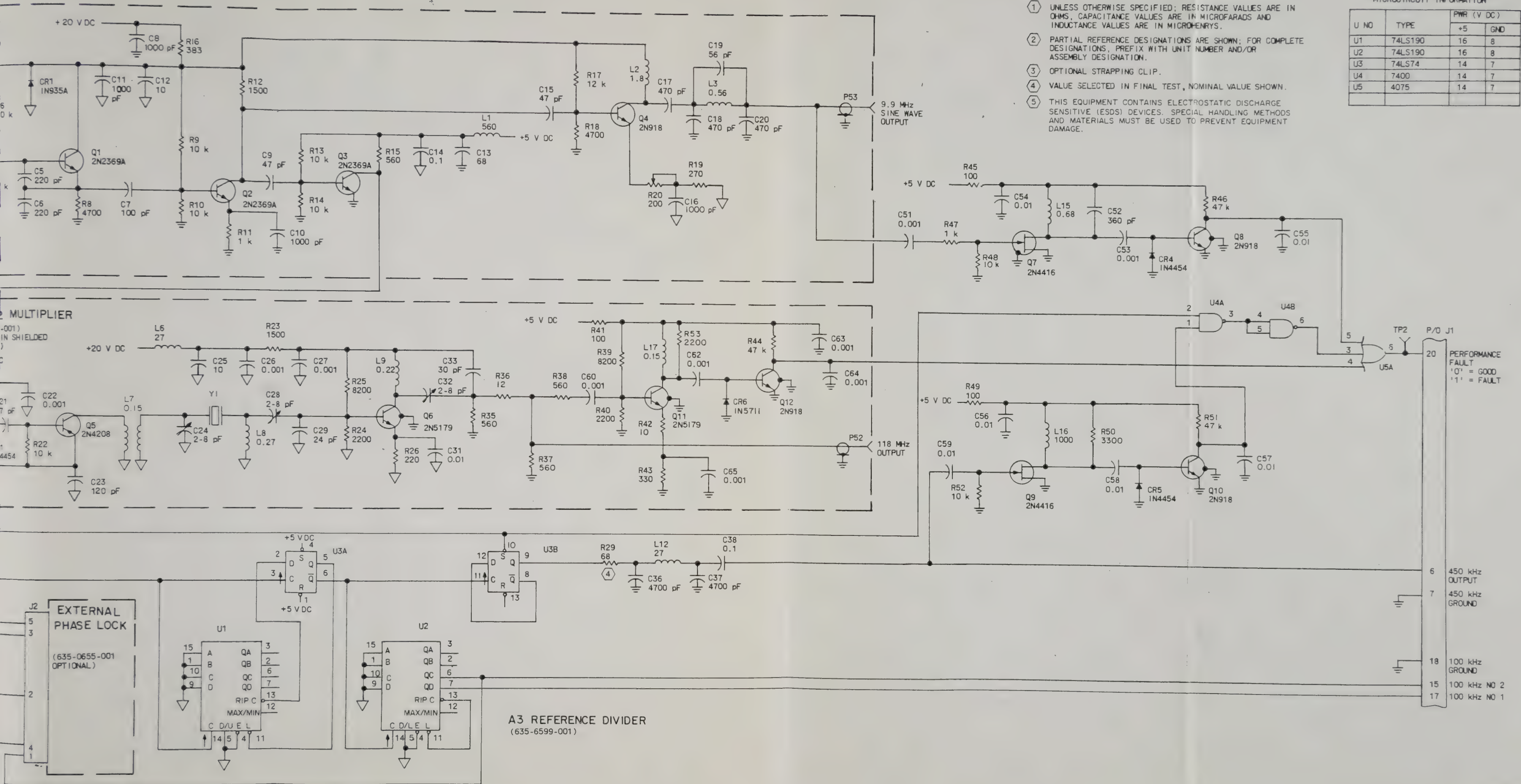


MULTIPLIER



634-6825

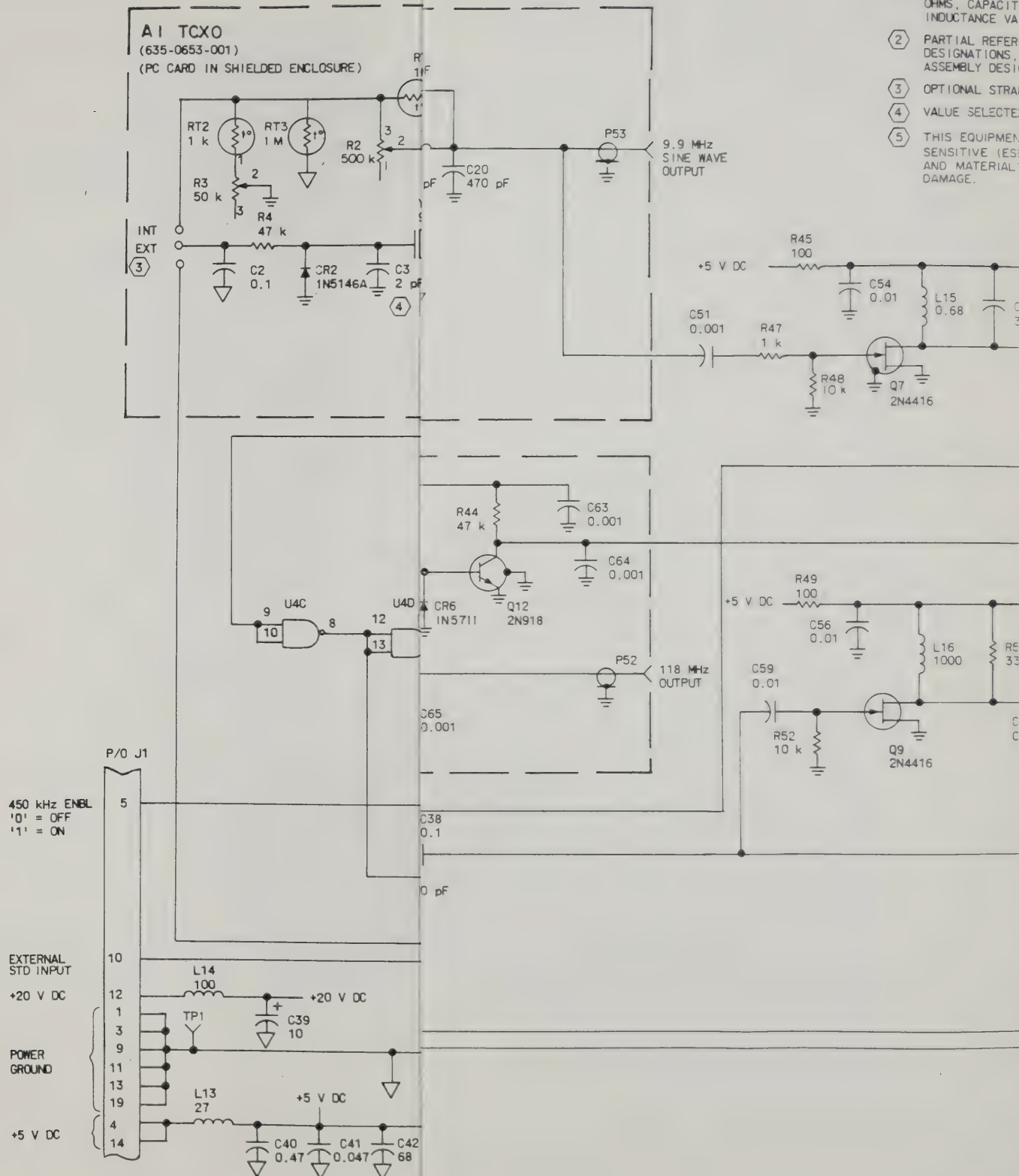
Synthesizer Reference, Schematic Diagram
Figure 4 (Sheet 3)



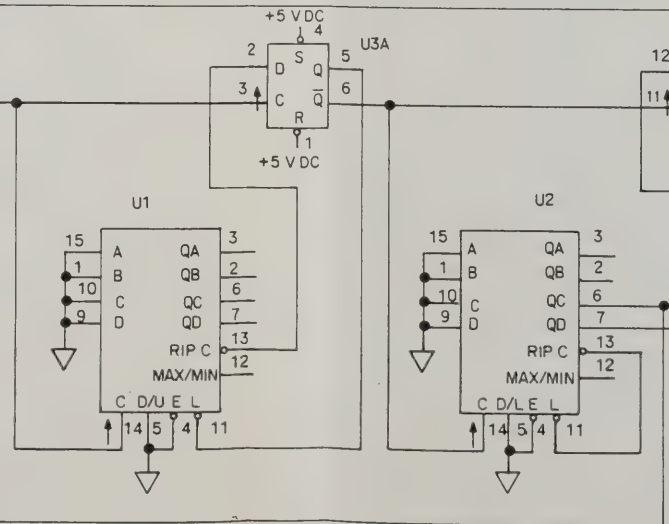
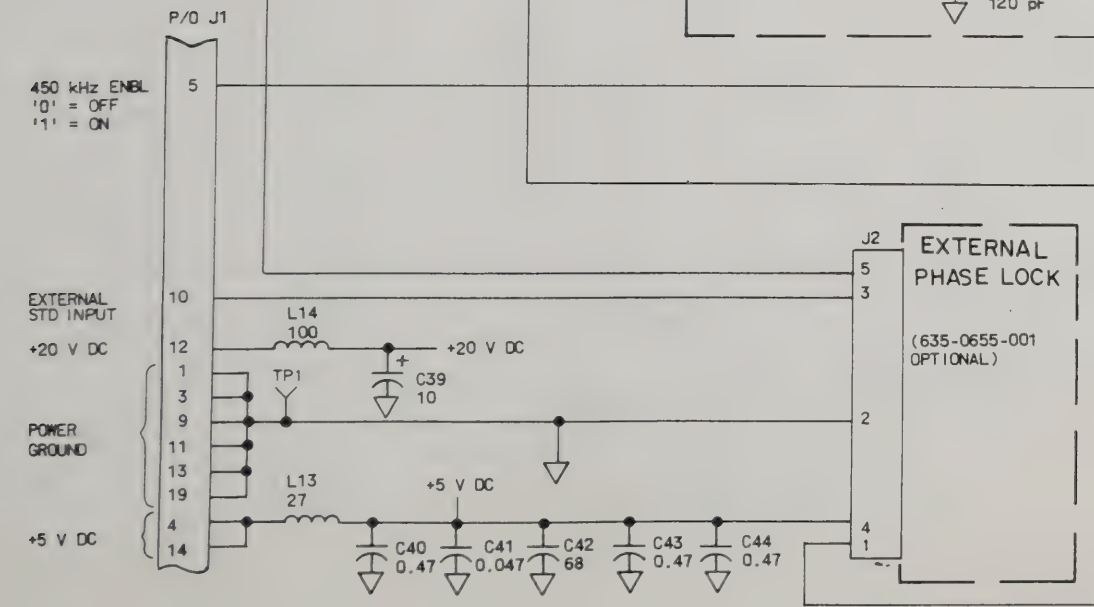
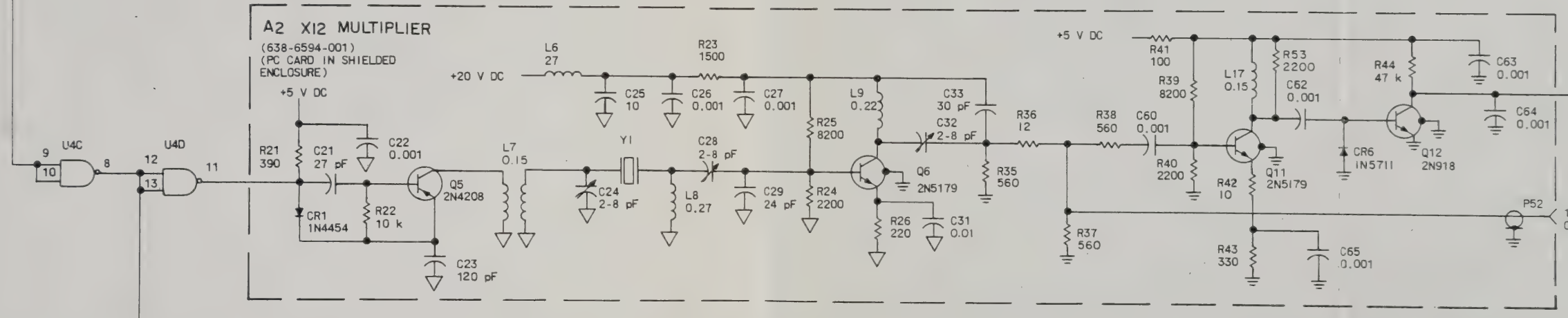
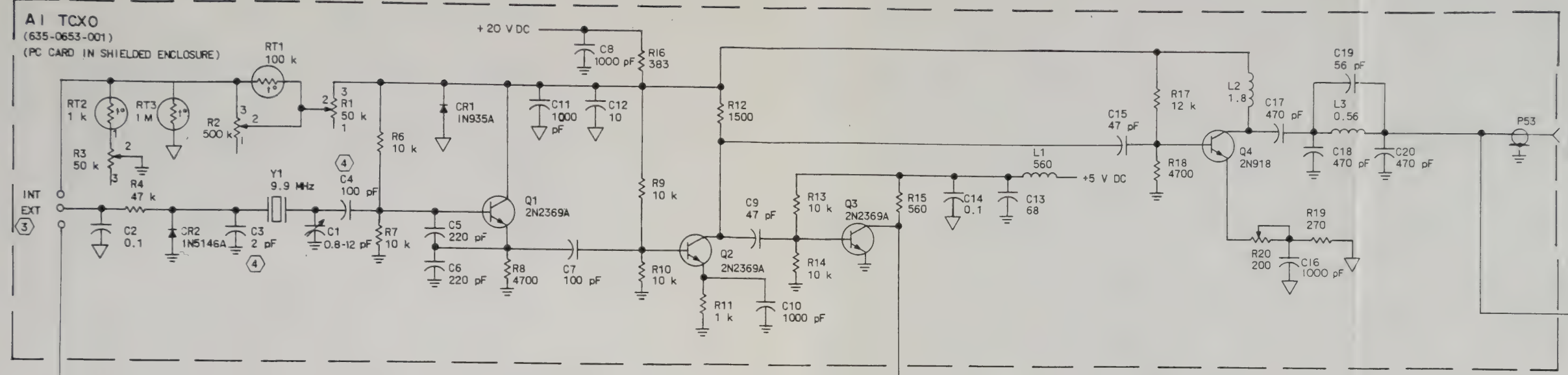
Synthesizer Reference, Schematic Diagram
Figure 4 (Sheet 3)

NOTES:

- ① UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES IN PICOFARADS, INDUCTANCE VALUES IN MICROHENRS.
- ② PARTIAL REFERENCE DESIGNATIONS, ASSEMBLY DESIGNATIONS, AND MATERIAL DESIGNATIONS ARE GIVEN IN THE PARTS LIST.
- ③ OPTIONAL STRAP.
- ④ VALUE SELECTOR.
- ⑤ THIS EQUIPMENT IS SENSITIVE TO ESD AND MATERIAL DAMAGE.



- NOTES:
- (1) UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES IN PICOFARADS, INDUCTOR VALUES IN MICROHENRS.
 - (2) PARTIAL REFERENCE DESIGNATIONS, ASSEMBLY DESIGNATIONS.
 - (3) OPTIONAL STRAP.
 - (4) VALUE SELECTED.
 - (5) THIS EQUIPMENT IS SENSITIVE TO ESD AND MATERIAL DAMAGE.



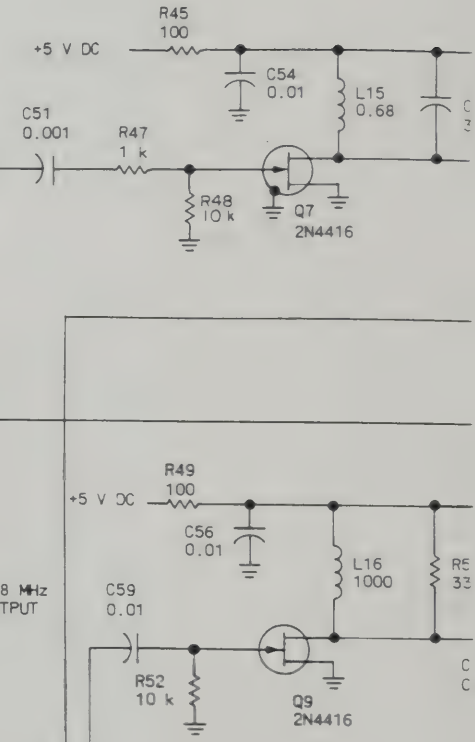
450 kHz ENBL
'0' = OFF
'1' = ON

EXTERNAL STD INPUT

POWER GROUND

+20 V DC

+5 V DC

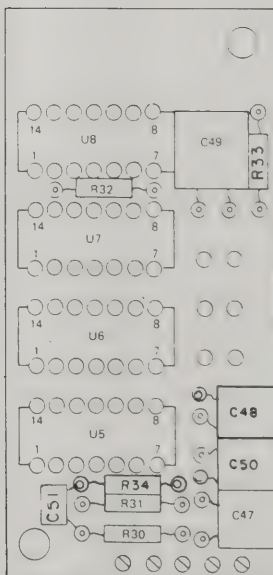


PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	EXTERNAL PHASE LOCK (OPTION)	635-0655-001			
C1-C46	NOT USED				
C47,C48	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C49	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 500V	912-3856-000		81349	CM04ED470J03
C50	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V (A1)	913-3279-200		16546	CY30C104M
C51	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 50V (B1)	912-4141-400		72136	DM5F151J050WV
R1-R29	NOT USED				
R30	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR07G470KS
R31	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W (A1)	745-0773-000		81349	RCR07G472KS
R31	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W (B2)	745-0761-000		81349	RCR07G222KS
R31	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R32	RESISTOR,FXD CMPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR07G471KS
R33	RESISTOR,FXD CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R34	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W (A1)(B2)	745-0761-000		81349	RCR07G222KS
R34	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
U1-U4	NOT USED				
U5	INTEGRATED CIRCUIT N74LS00A	351-1523-110		18324	N74LS00N
U6,U7	INTEGRATED CIRCUIT SN74LS90N	351-1636-010		01295	SN74LS90N
U8	INTEGRATED CIRCUIT SN74LS74N	351-1525-040		18324	N74LS74N883C

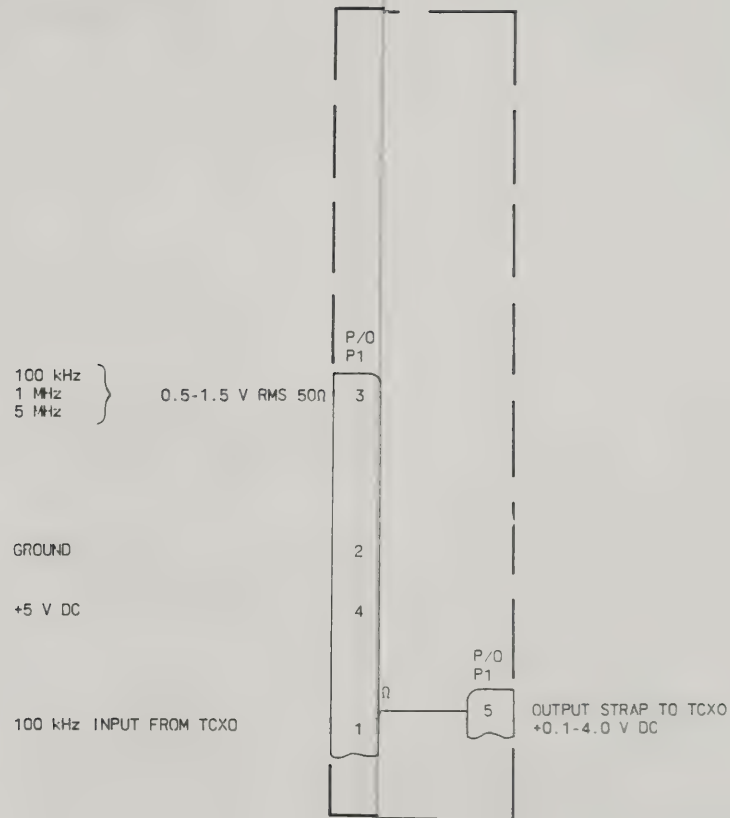
MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
	EXTERNAL PHASE-LOCK 635-0655-001	
A1	Added C50, 0.1μF. Added R34, 2200Ω. Changed R31 from 4700Ω to 2200Ω.	REV C and above
B1	Added C51, 150 pF.	REV G and above
B2	Changed R31 and R34 from 2200 Ω to 1 kΩ.	REV J and above



TP5-1212-019

External Phase Lock, Schematic Diagram
Figure 5 (Sheet 1 of 2)

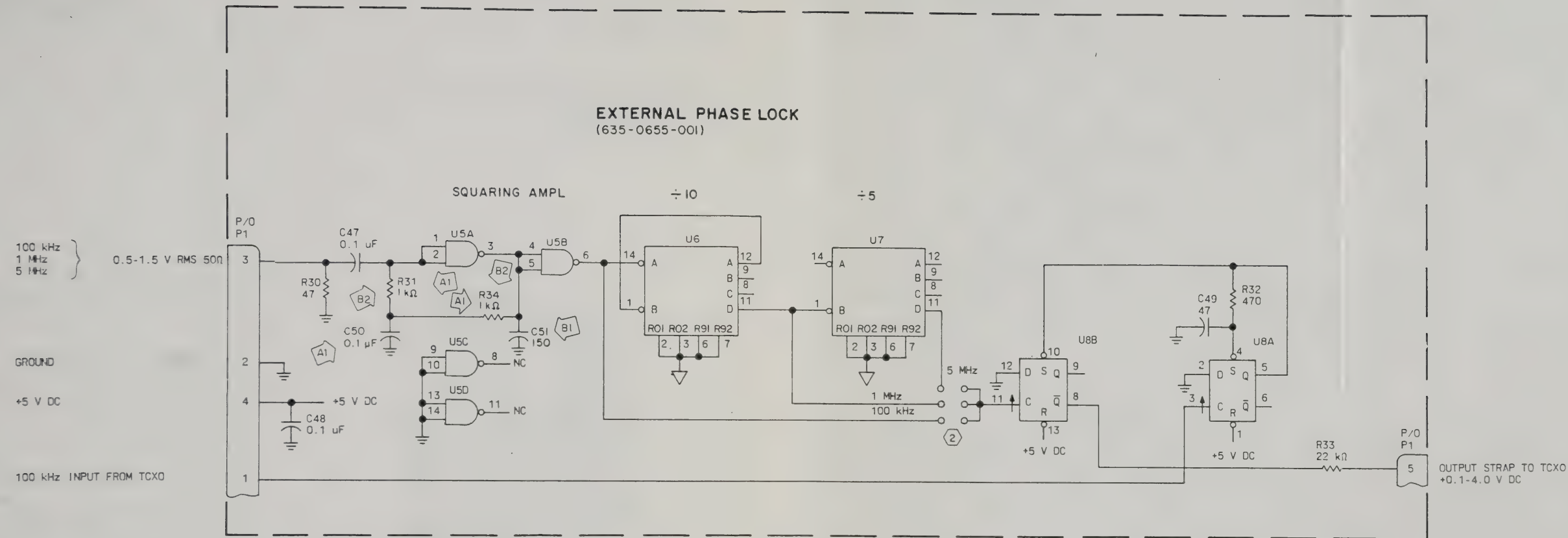


POWER AND GROUND CONNECTIONS

U NO.	TYPE	POWER (V DC)	
		+5	GND
U5	N74LS00A	14	7
U6, U7	SN74LS90N	5	10
U8	SN74LS74N	14	7

635-0430 SH 2

External Phase Lock, Schematic Diagram
Figure 5 (Sheet 2)



POWER AND GROUND CONNECTIONS

U NO.	TYPE	POWER (V DC)	
		+5	GND
U5	N74LS00A	14	7
U6, U7	SN74LS90N	5	10
U8	SN74LS74N	14	7

- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN PICO FARADS.
- ② OPTIONAL STRAPPING CLIP.

- ③ PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

635-0430 SH 2

External Phase Lock, Schematic Diagram
Figure 5 (Sheet 2)



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0767973-002211
2nd Edition, 1 October 1980

Synthesizer End Decade (635-0657-001)

Printed in USA

1. DESCRIPTION

Synthesizer End Decade 635-0657-001, shown in figure 1, is a 2-layer planar card with a 20-pin edge-on connector (2-layers, 10 pins each).

The synthesizer end decade consists of a logic circuit, a low-pass filter circuit, a vco circuit, a loss-of-lock (LOL) monitor circuit, and a divide-by-10 output circuit.

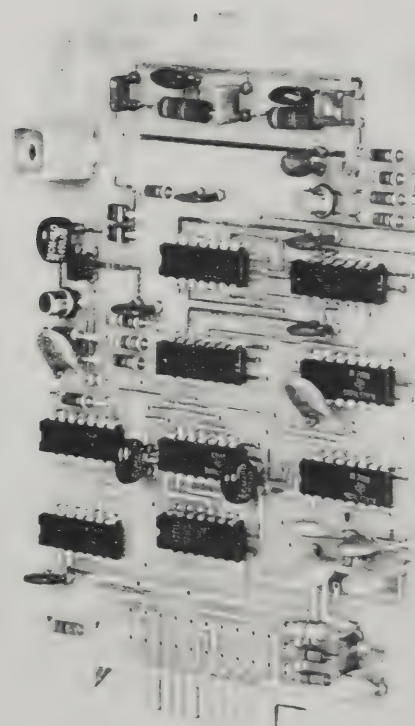
2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 2.)

The synthesizer end decade receives 100/10/1-Hz bcd frequency control signals and a 100-kHz reference signal, and generates a 600- to 510-kHz variable frequency output and a lock signal output (logic 1 for lock).

The logic circuits receive a 100-kHz reference input and a bcd frequency input. The bcd frequency input is used to program a variable frequency divider (divide-by-60 to divide-by-51). The programmed variable divider output (100 kHz) and the 100-kHz reference input are supplied to a phase/frequency discriminator that provides a control voltage proportional to the phase/frequency difference between its inputs.

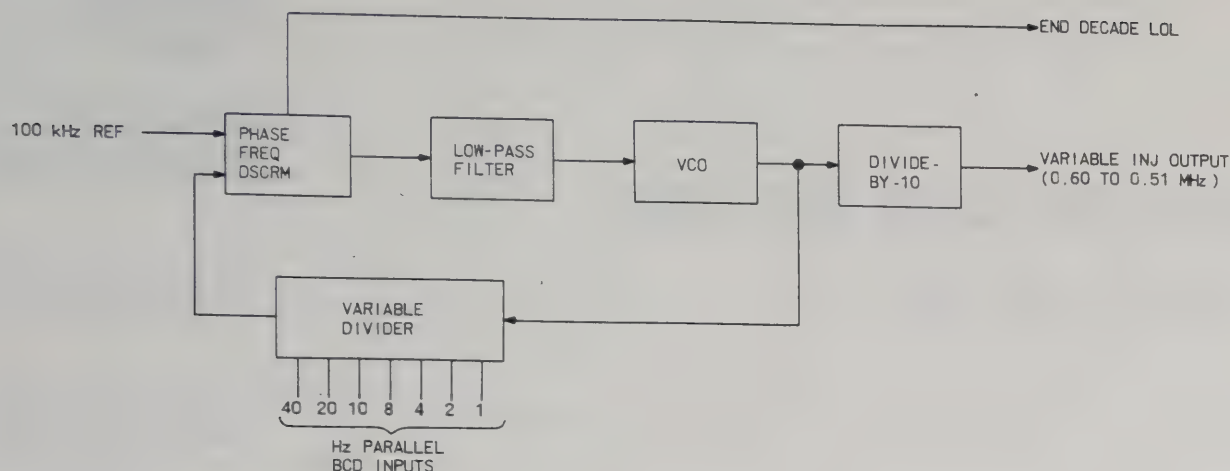
The vco circuit receives the control voltage signal from the logic circuits and is driven to and locked at the variable frequency as programmed by the



TP5-2335-017

Synthesizer End Decade
Figure 1

variable divider bcd inputs to the logic circuits. The vco output (6.0 to 5.1 MHz) is supplied to the logic circuits for clocking and lock signal generation. The vco output (6.0 to 5.1 MHz) is supplied through a divide-by-10 circuit to rf circuits for additional frequency mixing and generation.



TP5 -2362 -013

Block Diagram
Figure 2

2.2 Logic Circuits

The logic circuits receive a 100-kHz reference input, a vco signal output, and bcd frequency inputs, and supplies a control voltage output signal to the vco.

Refer to figure 3. The vco signal output (6.0 to 5.1 MHz) is supplied as the clock input to a programmable variable divider. The output of the programmable variable divider (100 kHz) is supplied to a phase/frequency discriminator and is compared with a 100-kHz reference input. A phase or frequency difference in the discriminator causes a control voltage input increase or decrease to adjust the frequency of the vco. If there is no phase or frequency difference, the discriminator provides a logic 1 lock signal output indicating the vco frequency is locked.

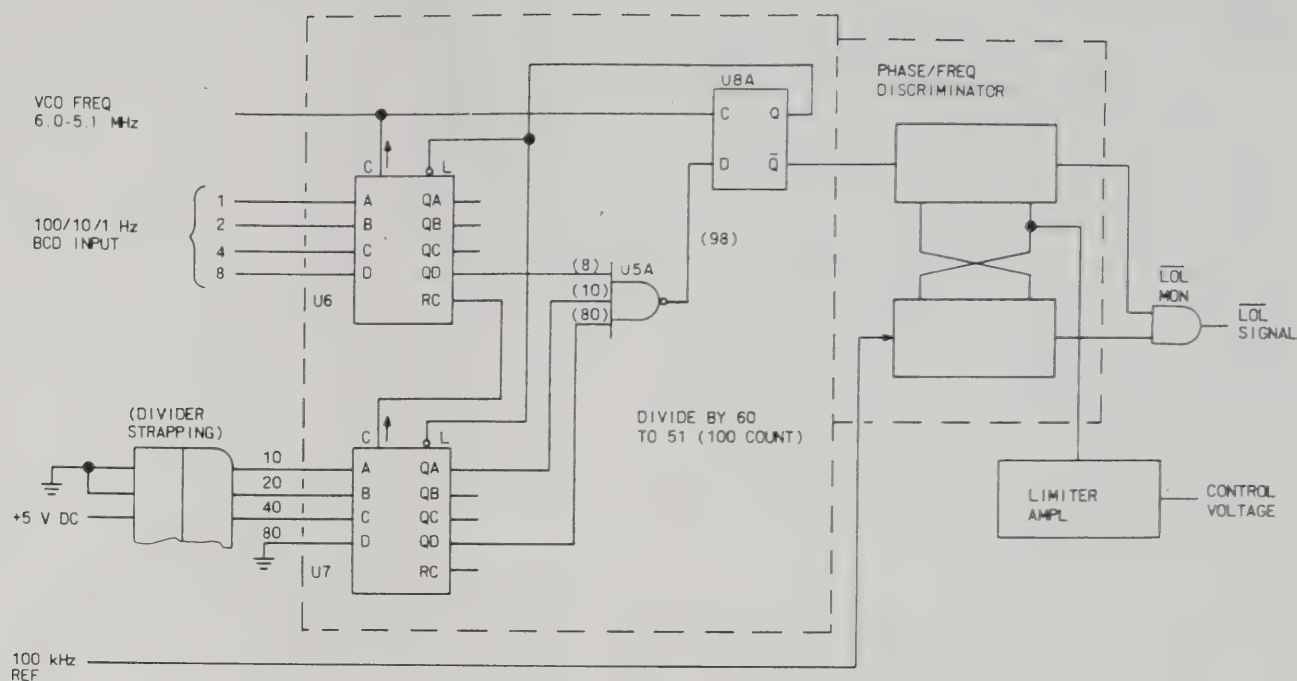
The programmable variable divider is programmed by the bcd frequency inputs. For example, if a bcd input of 0 is applied, the up/down decade counter is programmed to load the count 40 at any time a load signal (logic 0) is applied. Refer to table 1. This programs the variable divider to count from 40 (first count 41) to 100 (last count 100/40).

This causes the output of the variable divider to be 1/60th of the clock input or a divide-by-60 with a bcd input of 0. Note as the bcd input goes up 1, 2, 3, etc, the division ratio goes down -59, -58, -57, etc. Also

note, that for the divide-by-circuit to operate as a constant, the last clock 100 must also be the loaded count (in the case of bcd 0, count 40). To do this, prerecognition of count 100 is required. Look-ahead circuit U5A performs this function. At clock 58 (count 98) gate U5A is NANDed and supplies a logic 0 input to U8A-D. With a logic 0 at U8A-D, clock 59 (count 99) causes U8A-Q to go to logic 1 and loads decade counter to bcd input (NANDed output of U5A is removed). At clock 59, U8A-Q supplies a pulse to phase/frequency discriminator. Clock 60 (count 40) causes U8A-Q to go to logic 0 and enables decade counter to count on the next clock. Next clock is one above the bcd programmed input. Note that count 99 initiates the output from the divider and count 100 appears only as the bcd programmed input. Refer to figure 4. A 500-Hz programmed input is shown, the same principles apply to any other programmed bcd input.

2.3 VCO Circuits

The vco circuits receive a control voltage from the logic circuits. The control voltage drives the vco to the required vco frequency. The vco signal output is supplied through one buffer amplifier to the logic circuits and through a fixed divide-by-10 output circuit to the unit under control for additional frequency mixing and generation.



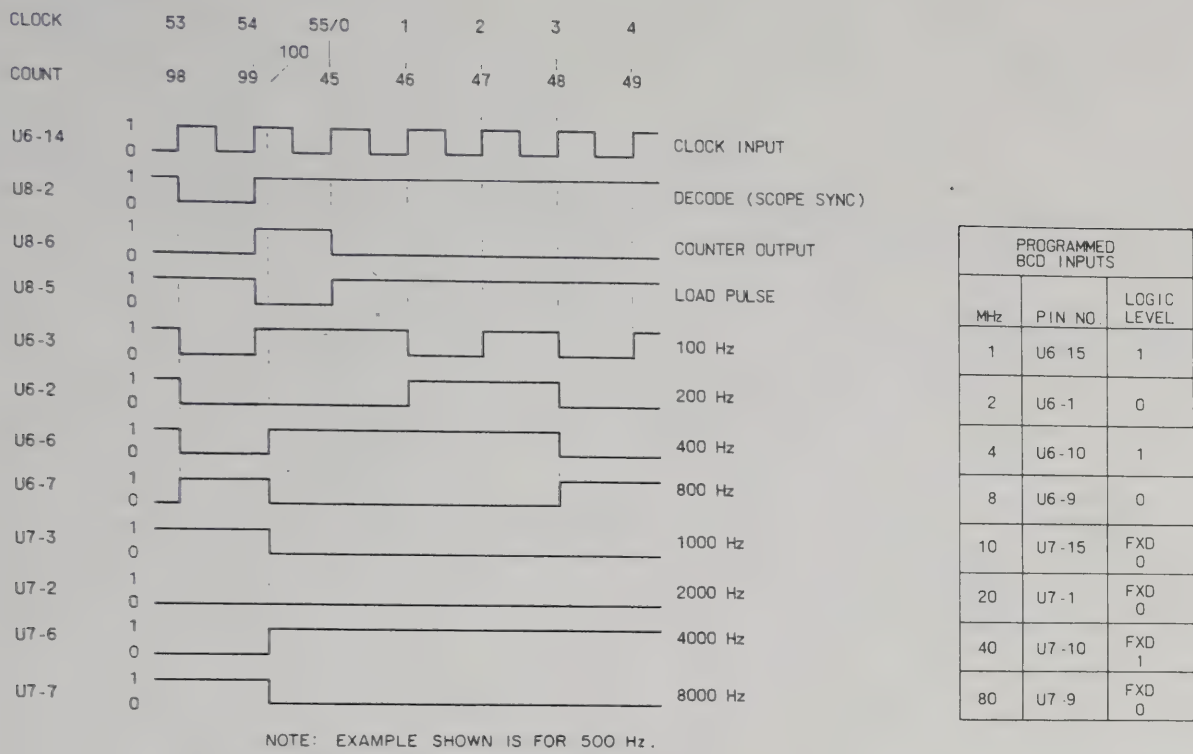
TP5-2363-013

Logic Circuit
Figure 3

Table 1. Variable Divider, Logic Truth Table.

BCD INPUT (100/10/1 Hz)	DIVIDER INPUTS								OUTPUT COUNT	DIVIDE BY	LOOP FREQ (MHz)
	U6				U7						
	A	B	C	D	**A	**B	¹ C	*D			
0	0	0	0	0	0	0	1	0	40	60	6.0
1	1	0	0	0	0	0	1	0	41	59	5.9
2	0	1	0	0	0	0	1	0	42	58	5.8
3	1	1	0	0	0	0	1	0	43	57	5.7
4	0	0	1	0	0	0	1	0	44	56	5.6
5	1	0	1	0	0	0	1	0	45	55	5.5
6	0	1	1	0	0	0	1	0	46	54	5.4
7	1	1	1	0	0	0	1	0	47	53	5.3
8	0	0	0	1	0	0	1	0	48	52	5.2
9	1	0	0	1	0	0	1	0	49	51	5.1

*Internally strapped for logic 0 (ground).
**Externally strapped for logic 0 (ground) at pins 7 and 17.
¹Externally strapped for logic 1 (+5.2 V dc) at pin 16.



Variable Divider, Inputs and Outputs
Figure 4

TP5-2366-013

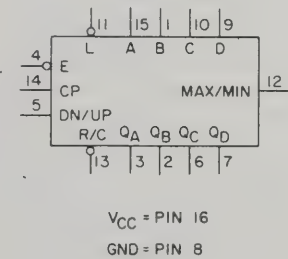
2.4 Up/Down Decade Counter 351-1527-040 (Refer to table 2.)

The 351-1527-040 up/down decade counter is a 4-bit decade counter. Synchronous operation is provided by having all flip-flops clocked simultaneously so that the outputs change coincident with each other when input conditions are met.

A high at the enable input inhibits counting. A low at the enable input and a low-to-high clock transition triggers the four master/slave flip-flops. The enable input should be changed only when the clock is high. The down/up input determines the direction of the count. When low, the count goes up; when high, the count goes down.

These counters are programmable. The outputs may be preset to any state by placing a low on the load input and entering the desired data at the data inputs. The output changes to agree with the data inputs independently of the state of the clock input. This allows the counters to be used as modulo-N dividers by modifying the count length with the preset inputs.

Two outputs are available to perform the cascading function: ripple clock and maximum/minimum count. The latter output produces a high level output



Up/Down Decade Counter 351-1527-040
Figure 5

TP5-2325-013

pulse with a duration approximately equal to one complete cycle of the clock when the counter overflows or underflows. The ripple clock output produces a low level output pulse equal in width to the low level portion of the clock input when an overflow or underflow condition exists. The counters are cascaded by feeding the ripple clock output to the enable input of the succeeding counter if parallel clocking is used or to the clock input if parallel enabling is used. The maximum/minimum count output can be used to accomplish look-ahead for high-speed operation.

Table 2. Up/Down Decade Counter 351-1527-040,
Logic Truth Table.

PROGRAMMABLE INPUTS				COUNT	BCD OUTPUTS			
A	B	C	D		QA	QB	QC	QD
0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	0	0	0
0	1	0	0	2	0	1	0	0
1	1	0	0	3	1	1	0	0
0	0	1	0	4	0	0	1	0
1	0	1	0	5	1	0	1	0
0	1	1	0	6	0	1	1	0
1	1	1	0	7	1	1	1	0
0	0	0	1	8	0	0	0	1
1	0	0	1	9	1	0	0	1

E (enable): logic 0 enables counter; logic 1 inhibits counter.

L (load): logic 0 programs the bcd output count to be set at the bcd count of the programmable inputs; the next clock pulse counts one higher/lower (up/down).

DU (down/up): logic 0 counts up; logic 1 counts down.

CP (clock pulse): logic 0-to-logic 1 transition advances counter.

RC (ripple clock): logic 0 pulse equal to 1/2 clock cycle when an overflow occurs.

MM (maximum/minimum count): logic 1 pulse equal to full clock cycle when an overflow or underflow occurs.

2.5 Decade Counter 351-1636-010 (Refer to table 3.)

The 351-1636-010 decade counter is a high-speed, monolithic decade counter consisting of four dual-rank, master-slave flip-flops internally interconnected to provide a divide-by-2 counter and a divide-by-5 counter. Gated direct reset lines are provided to inhibit count inputs and return all outputs to a logical 0 or to a binary coded decimal (bcd) count of 9. As the output from flip-flop A is not internally connected to the succeeding stages, the count may be separated in three independent count modes:

- When used as a binary coded decimal decade counter, the BD input must be externally connected to the A output. The A input receives the incoming count, and a count sequence is obtained in accordance with the bcd count sequence truth table shown above. In addition to a conventional 0 reset, inputs are provided to reset a bcd 9 count for 9's complement decimal applications.

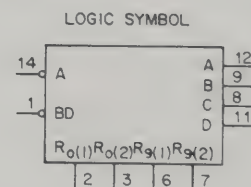
- If a symmetrical divide-by-10 count is desired for frequency synthesizers or other applications requiring division of a binary count by a power of 10, the D output must be externally connected to the A input. The input count is then applied at the BD input and a divide-by-10 square wave is obtained at output A.
- For operation as a divide-by-2 counter and divide-by-5 counter, no external interconnections are required. Flip-flop A is used as a binary element for the divide-by-2 function. The BD input is used to obtain binary divide-by-5 operation at the B, C, and D outputs. In this mode, the two counters operate independently; however, all four flip-flops are reset simultaneously.

Table 3. Decade Counter 351-1636-010, Logic Truth Table.

*BCD COUNT SEQUENCE				
COUNT	OUTPUT			
	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

**RESET/COUNT				
RESET INPUTS				OUTPUT
R ₀₍₁₎	R ₀₍₂₎	R ₉₍₁₎	R ₉₍₂₎	D C B A
1	1	0	X	0 0 0 0
1	1	X	0	0 0 0 0
X	X	1	1	1 0 0 1
X	0	X	0	Count
0	X	0	X	Count
0	X	X	0	Count
X	0	0	X	Count

*Output A connected to input BD for BCD count.
 **X indicates that either a logical 1 or a logical 0 may be present.



TP5-2326-012

Decade Counter 351-1636-010
Figure 6

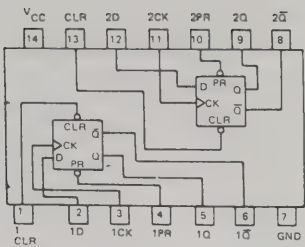
2.6 Dual D-Type Flip-Flop With Preset and Clear
351-1525-040 (Refer to table 4.)

The 351-1525-040 consists of dual, high-speed, D-type flip-flops. Information on the D input is transferred to the Q output on the positive going edge of the clock pulse. Clock triggering occurs at a voltage level of the clock pulse and is not directly related to the transition time of the positive going pulse. When the clock input is at either high or low level, the D-input signal has no effect.

Table 4. Dual D-Type Flip-Flop With Preset and Clear 351-1525-040, Logic Truth Table.

INPUTS				OUTPUTS	
PRESET	CLEAR	CLOCK	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	*H	*H
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q _O	$\overline{Q}_O$

H = high level (steady state)
L = low level (steady state)
X = irrelevant
↑ = transition from low to high level
Q_O = the level of Q before the indicated input conditions were established.
* This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (high) level.



TP5-2327-011

Dual D-Type Flip-Flop With Preset and Clear 351-1525-040
Figure 7

3. TESTING/TROUBLESHOOTING
PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the synthesizer end decade are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 5 check total performance of the synthesizer end decade. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

Table 5. Synthesizer End Decade, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of the unit containing the synthesizer end decade that is to be tested. b. Remove cover from the synthesizer section of the unit. c. Remove synthesizer end decade, install it on an extender card, and place it in the unit. d. Set unit LINE SELECTOR switch to 115 V. e. Connect unit to 115-V ac power source and set power on.		
(Cont)			

Table 5. Synthesizer End Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. (Cont)	f. Measure dc voltage from P1-20 and P1-2 to P1-6 (ground).	+5.2 $\pm$ 0.2 V dc.	Check unit synthesizer voltage regulator.
	g. Measure dc voltage from P1-10 to P1-6 (ground).	NLT +19.5 V dc, NMT +20.8 V dc.	Check unit synthesizer voltage regulator.
2. Test procedures	a. Set the end frequency control to 9. b. Measure dc voltage at cathode end of CR1-CR2. (Refer to figure 8 for CR1-CR2 cathode location.) Note Prior to REV C voltage at CR1-CR2 should be at 9.5 $\pm$ 0.2 V dc. c. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). d. Note the frequency counter reading while moving the frequency control from 9 down to 0. (Refer to chart.) Note Prior to REV C voltage at CR1-CR2 should be 9.5 $\pm$ 0.2 V dc and increase in 0.5 V dc steps. e. Measure the dc voltage at P1-12.	7.0 $\pm$ 0.2 V dc. (see note) 510 $\pm$ 0.5 kHz. Note that the frequency reading increases by 10 kHz with each step of the frequency control. Reading should be 600 $\pm$ 0.5 kHz with frequency control at 0. NLT +3.5 V dc. Note RCV FAULT, EXCTR FAULT, or R/E FAULT indicator lighting indicates that result of step f. is satisfactory.	Adjust L6 for 9.5 $\pm$ 0.1 V dc. If L6 adjustment does not correct the problem, check Q1, Q2, and associated circuit. Adjust L6 for 510 kHz with 7.0 $\pm$ 0.2 V dc at cathode end of CR1-CR2. If L6 adjustment does not correct the problem, check Q1, Q2, and associated circuit. Check U6, U7, U8, and associated circuits. Check U3, U4, and U5.
(Cont)	f. Ground P1-5 while noting the voltage of P1-12.	NMT 0.5 V dc.	Check U1, U2, U3, U4, and U5.

Table 5. Synthesizer End Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE		NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	g. Remove P1-5 ground.			
	LOW END FREQ DIGIT	CR1-CR2 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)	
	9	7.0 $\pm$ 0.2	510 $\pm$ 0.5	
	8	7.5 $\pm$ 0.2	520 $\pm$ 0.5	
	7	8.0 $\pm$ 0.2	530 $\pm$ 0.5	
	6	8.5 $\pm$ 0.2	540 $\pm$ 0.5	
	5	9.0 $\pm$ 0.2	550 $\pm$ 0.5	
	4	9.5 $\pm$ 0.2	560 $\pm$ 0.5	
	3	10.0 $\pm$ 0.2	570 $\pm$ 0.5	
	2	10.5 $\pm$ 0.2	580 $\pm$ 0.5	
	1	11.0 $\pm$ 0.2	590 $\pm$ 0.5	
	0	11.5 $\pm$ 0.2	600 $\pm$ 0.5	

4. ALIGNMENT/ADJUSTMENT

Refer to table 5 for adjustment of L6. Perform test 2, steps a through c.

5. REPAIR

Repair of the synthesizer end decade is accomplished using the standard planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 8). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change.

Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applied to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

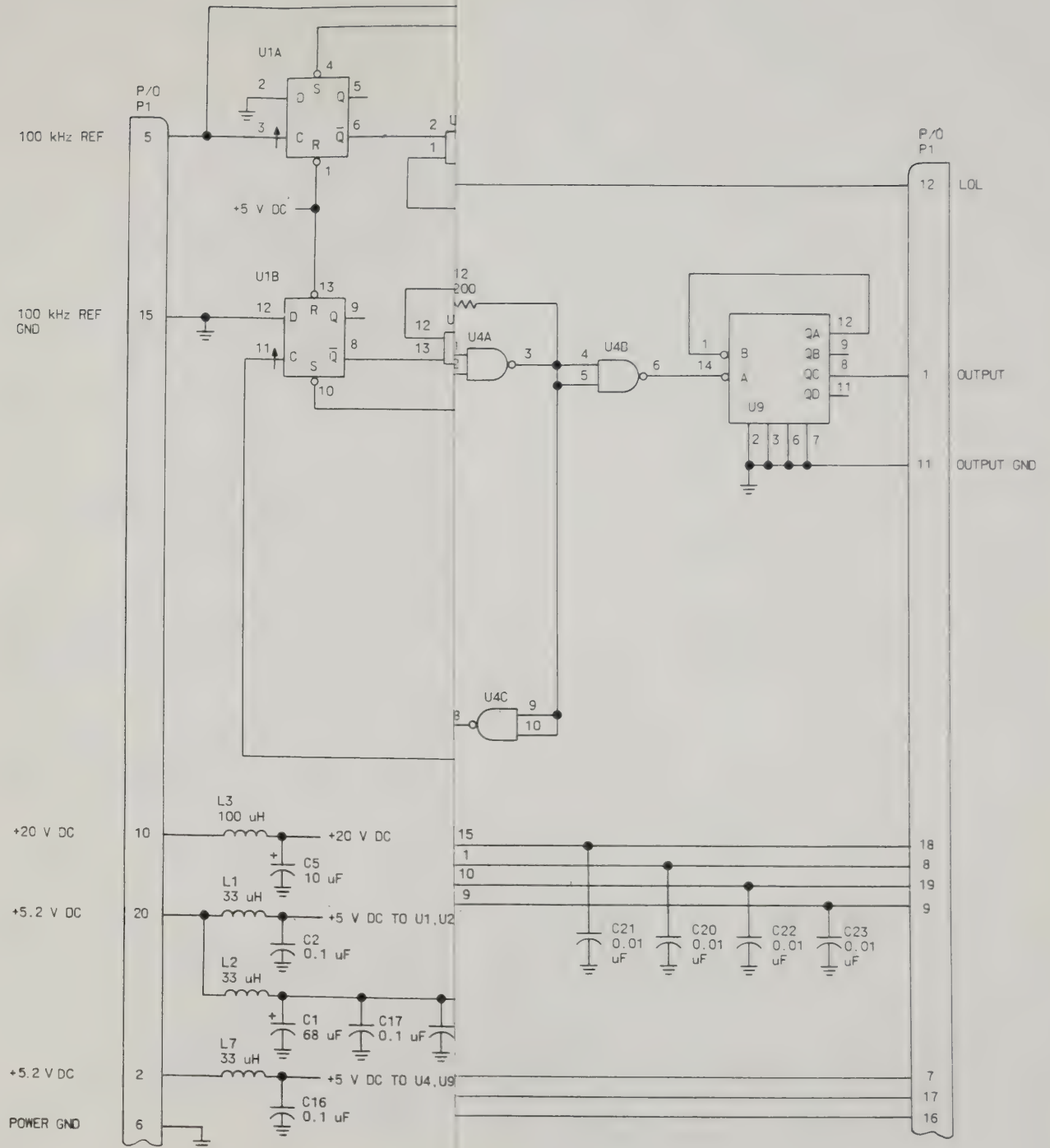
<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
01295	Texas Instruments, Inc. U.S. Semiconductor Group P.O. Box 5012 13500 N. Central Expressway Dallas, TX 75222
04713	Motorola, Inc. Semiconductor Products Group 5005 E. McDowell Rd. Phoenix, AZ 85008
07910	Teledyne Semiconductor 1300 Terra Bella Ave. Mountain View, CA 94043
12294	Erie Technological Products of Canada, Ltd. 5 Fraser Ave. Tenton, Ont., Can. K8V 5S1
14433	ITT Semiconductors P.O. Box 3049 3301 Electronics Way West Palm Beach, FL 33402
16546	U.S. Capacitor Corp/Centralab Electronics Div. 4561 Colorado Los Angeles, CA 90039

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
18324	Signetics Corp. 811 E. Arques Ave. Sunnyvale, CA 94086
18796	Erie Technological Products, Inc State College Div. 1900 W. College Ave. State College, PA 16801
20462	PREM Enterprises, Inc. 3519 N. Chapel Hill McHenry, IL 60050
34335	Advanced Micro Devices 901 Thompson Pl. Sunnyvale, CA 94086
56289	Sprague Electric Co. North Adams, MA 01247
81349	Military Specifications
96906	Military Standards

6.3 Equipment Covered

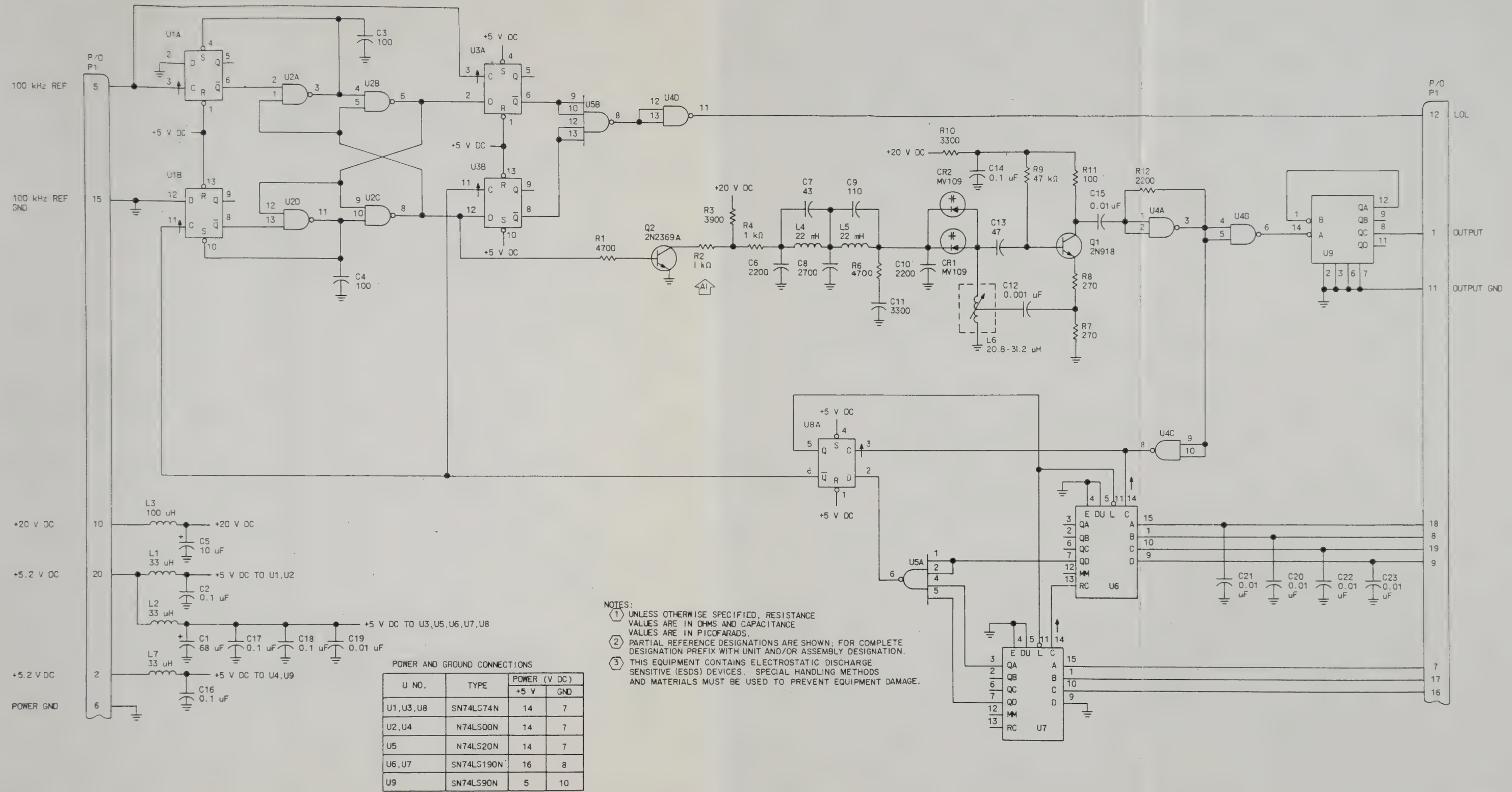
Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Synthesizer end decade	635-0657-001	REV C

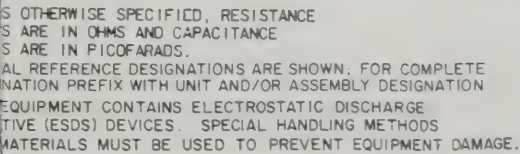


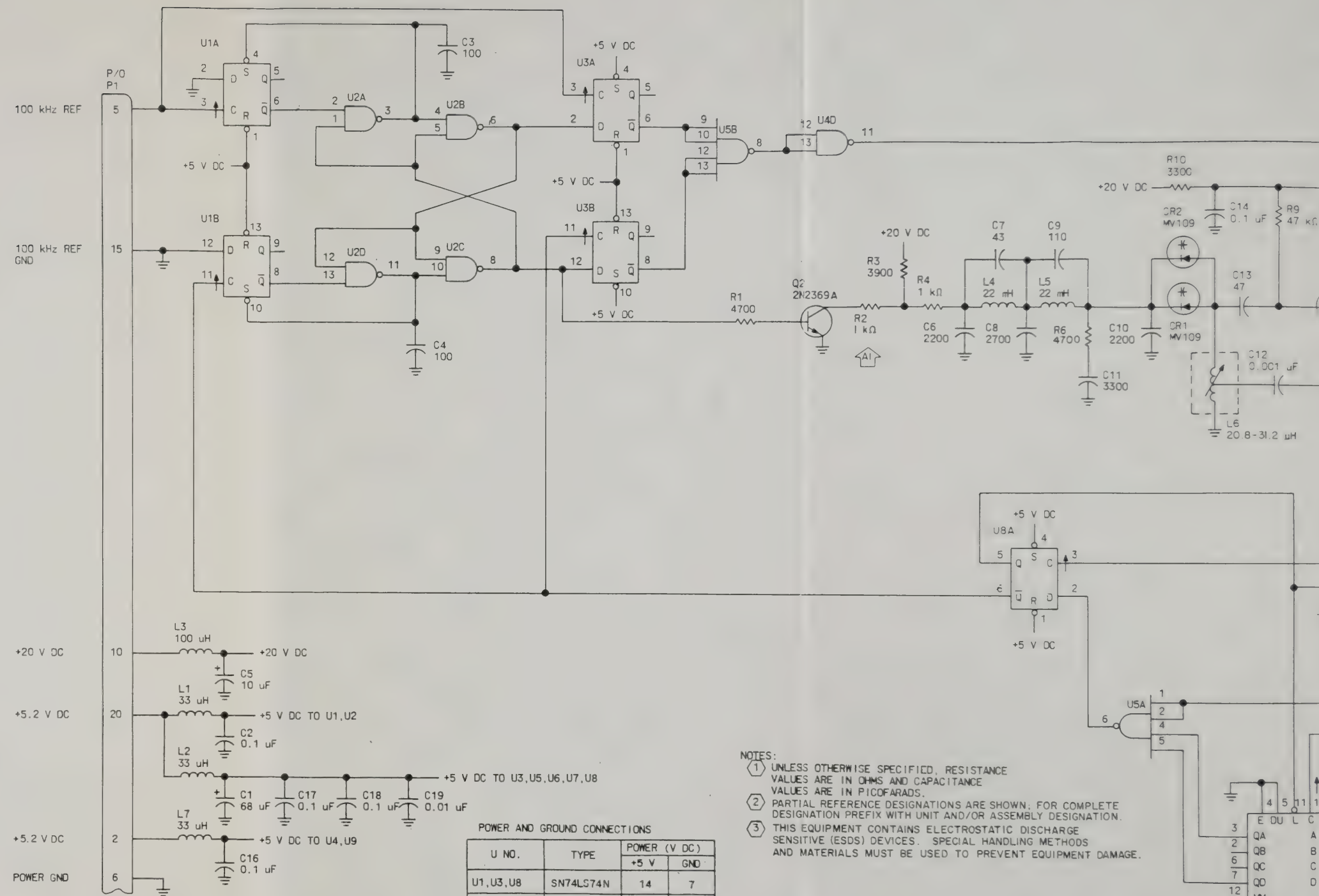
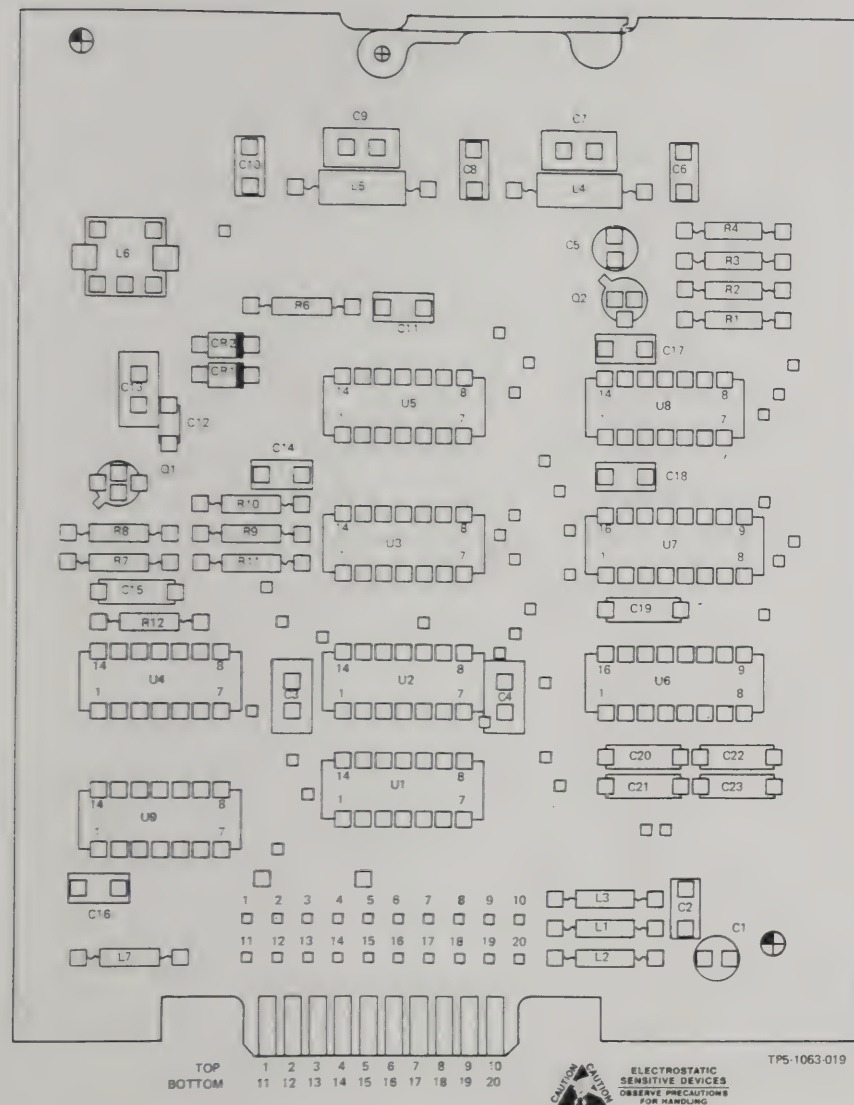
635-0428
TP4-6927-014

Synthesizer End Decade, Schematic Diagram
Figure 8 (Sheet 1 of 2)



Synthesizer End Decade, Schematic Diagram
Figure 8 (Sheet 1 of 2)





matic Diagram
9)

*Synthesizer End Decade, Schematic Diagram
Figure 8 (Sheet 2)*

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE
	SYNTH END DECADE (ESDS)	635-0657-001		
CR1,CR2	SEMICONDUCTOR DEVICE GL DIEL, 0.8 TO 8.5PF, 1000V	922-6124-040		04713 S
C1	CAPACITOR,FXD ELCTLT, 68UF, 20%, 6V	154-9102-040		56289 I
C2	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 C
C3,C4	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 500V	912-3679-000		81349 C
C5	CAPACITOR,FXD ELCTLT, 10UF, 20%, 25V	154-9102-240		56239 I
C6	CAPACITOR,FXD CER DIEL, 2200PF, FORM5%, 100V	913-3281-300		18796 A
C7	CAPACITOR,FXD MICA DIEL, 43PF, 5%, 500V	912-3854-000		81349 C
C8	CAPACITOR,FXD CER DIEL, 0.0027UF, 5%, 100V	913-3117-110		81349 C
C9	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 500V	912-389C-000		81349 C
C10	CAPACITOR,FXD CER DIEL, 2200PF, FORM5%, 100V	913-3281-300		18796 A
C11	CAPACITOR,FXD CER DIEL, 3300PF, FORM10%, 100V	913-3281-170		16796 A
C12	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		51349 C
C13	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 500V	912-3956-000		81349 C
C14	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 C
C15	CAPACITOR,FXD CER DIEL, 0.01UF, M20%P80%, 100V	913-3680-000		12294 A
C16-C18	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546 C
C19-C23	CAPACITOR,FXD CER DIEL, 0.01UF, M20%P80%, 100V	913-3680-000		12294 A
L1,L2	COIL,RF 33UH	240-2041-000		96906 M
L3	COIL,RF 100UH	240-2047-000		96906 M
L4,L5	COIL,RF 22000UH	240-2715-650		96906 M
L6	INDUCTOR,RF	242-0441-050		20462 Z
L7	COIL,RF 33UH	240-2041-000		96906 M
Q1	TRANSISTOR	352-0440-000		07910 Z
Q2	TRANSISTOR	352-0595-030		14433 Z
R1	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349 R
R2	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W (A1)	745-0761-000		81349 R
R2	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349 R
R3	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/4W	745-0770-000		81349 R
R4	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349 R
R5	NOT USED			
R6	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349 R
R7,R8	RESISTOR,FXD CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349 R
R9	RESISTOR,FXD CMPSN, 47K, 10%, 1/4W	745-0809-000		81349 R
R10	RESISTOR,FXD CMPSN, 3.3K, 10%, 1/4W	745-0767-000		81349 R
R11	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349 R
R12	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349 R
U1	INTEGRATED CIRCUIT	351-1525-040		18324 N
U2	INTEGRATED CIRCUIT	351-1523-110		18324 N
U3	INTEGRATED CIRCUIT	351-1525-040		18324 N
U4	INTEGRATED CIRCUIT	351-1523-110		18324 N
U5	INTEGRATED CIRCUIT	351-1523-130		18324 N
U6,U7	INTEGRATED CIRCUIT (ESDS)	351-1527-040		34335 S
U8	INTEGRATED CIRCUIT	351-1525-040		18324 N
U9	INTEGRATED CIRCUIT	351-1636-010		01295 S

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed R2 from 2200Ω to 1kΩ,	REV C and above

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	SYNTH END DECADE (ESDS)	635-0657-001			
CR1,CR2	SEMICOND DEVICE GL DIEL, 0.8 TO 8.5PF, 1000V	922-6124-040		04713	SHV1276
C1	CAPACITOR,FXD ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	19SD686X0006DB1
C2	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C3,C4	CAPACITOR,FXD MICA DIEL, 100PF, 5%, 500V	912-3879-003		81349	CM04F0101J03
C5	CAPACITOR,FXD ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	19SD106X0025CB1
C6	CAPACITOR,FXD CER DIEL, 2200PF, FORM5%, 100V	913-3281-300		18796	8131-100C0G222J
C7	CAPACITOR,FXD MICA DIEL, 43PF, 5%, 500V	912-3854-000		81349	CM04ED430J03
C8	CAPACITOR,FXD CER DIEL, 0.0027UF, 5%, 100V	913-3117-130		81349	CCR0cCG272J
C9	CAPACITOR,FXD MICA DIEL, 110PF, 5%, 500V	912-3882-000		81349	CM04F0111J03
C10	CAPACITOR,FXD CER DIEL, 2200PF, FORM5%, 100V	913-3281-300		18796	8131-100C0G222J
C11	CAPACITOR,FXD CER DIEL, 3300PF, FORM10%, 100V	913-3281-170		18796	8131-100C0G332K
C12	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BV10CK
C13	CAPACITOR,FXD MICA DIEL, 47PF, 5%, 500V	912-3855-000		81349	CM04ED470J03
C14	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C15	CAPACITOR,FXD CER DIEL, 0.01UF, M20%P80%, 100V	913-3680-000		12294	805-014X5V0103Z
C16-C18	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104M
C19-C23	CAPACITOR,FXD CER DIEL, 0.01UF, M20%P80%, 100V	913-3680-000		12294	805-014X5V0103Z
L1,L2	COIL,RF 33UH	240-2041-000		96906	MS75085-01
L3	COIL,RF 100UH	240-2047-000		96906	MS75085-07
L4,L5	COIL,RF 2200UH	240-2715-650		96906	MS75089-39
L6	INDUCTOR,RF	242-0441-050		20462	242-0441-050
L7	COIL,RF 33UH	240-2041-000		96906	MS75085-01
Q1	TRANSISTOR	352-0440-000		07910	2N918
Q2	TRANSISTOR	352-0596-030		14433	2N2369A
R1	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R2	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W (A1)	745-0761-000		81349	RCR07G222KS
R2	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R3	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/4W	745-0770-000		81349	RCR07G392KS
R4	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R5	NOT USED				
R6	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R7,R8	RESISTOR,FXD CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R9	RESISTOR,FXD CMPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G473KS
R10	RESISTOR,FXD CMPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G332KS
R11	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R12	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS
U1	INTEGRATED CIRCUIT	351-1525-040		18324	N74LS74NS83C
U2	INTEGRATED CIRCUIT	351-1523-110		18324	N74LS00N
U3	INTEGRATED CIRCUIT	351-1525-040		18324	N74LS74NS83C
U4	INTEGRATED CIRCUIT	351-1523-110		18324	N74LS00N
U5	INTEGRATED CIRCUIT	351-1523-130		18324	N74LS20N
U6,U7	INTEGRATED CIRCUIT (ESDS)	351-1527-040		34335	SN74LS190N
U8	INTEGRATED CIRCUIT	351-1525-040		18324	N74LS74NS83C
U9	INTEGRATED CIRCUIT	351-1636-010		01295	SN74LS90N

MODIFICATION HISTORY

REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed R2 from 2200Ω to 1kΩ.	REV C and above

Synthesizer Decade (623-2080-001, -002, -003, -004)



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0767972-301211

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Synthesizer Decade
(623-2080-001, -002, -003, -004)

1. DESCRIPTION.

Synthesizer Decades 623-2080-001, -002, -003, -004, shown in figure 1 and listed in table 1, are 2-layer planar cards with 20-pin edge-on connectors (2 layers, 10 pins each). The modules differ only in strapping and frequency control/output, as indicated on the schematic, figure 14.

Table 1. Cards Covered by These Instructions.

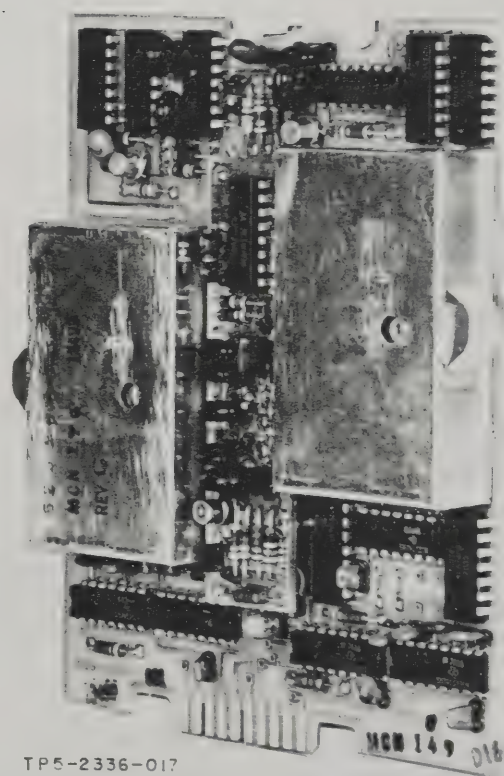
CARD TYPE	COLLINS PART NO
100-kHz synthesizer decade	623-2080-001
10-kHz synthesizer decade	623-2080-002
1-kHz synthesizer decade	623-2080-003
100/10-Hz synthesizer decade	623-2080-004

The synthesizer decade module consists of translator logic, translator vco, output mixer, output logic, output vco, low-pass filter circuits, a divide-by-10 output circuit, and a loss-of-lock (LOL) monitor circuit.

2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 2.)

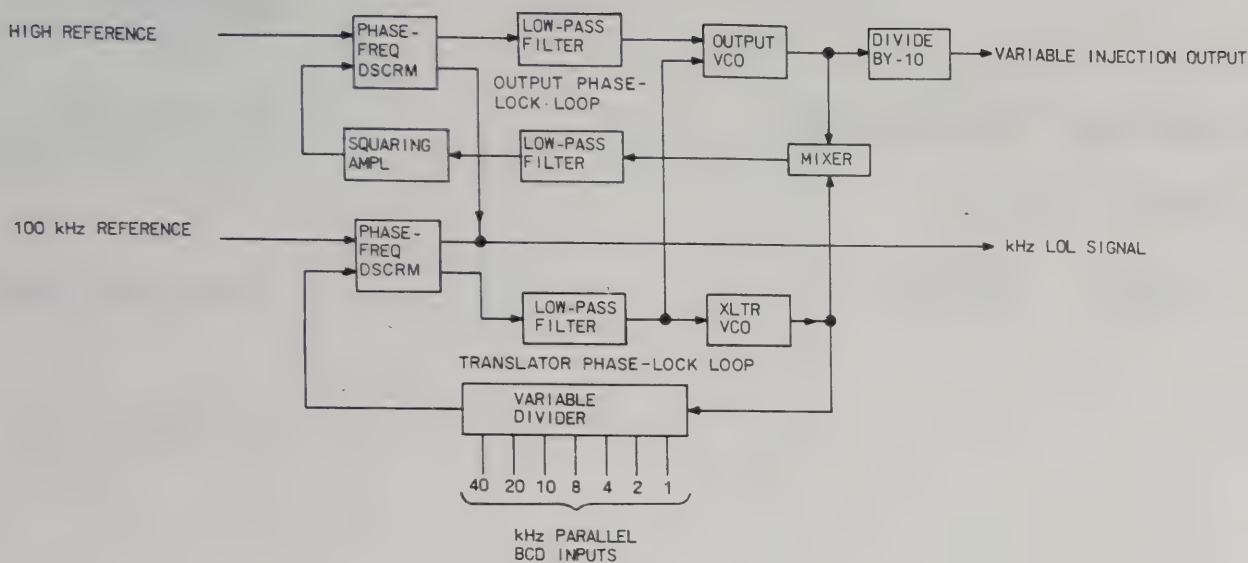
The synthesizer decade module receives bcd frequency control signals, a 100-kHz reference signal, and a high-reference signal, and generates a variable injection signal output and a lock signal output (logic 1 for lock). The variable injection signal output is used as the high-reference signal in the next frequency step in



Synthesizer Decade
Figure 1

the generation of a 79.35001- to 109.35-MHz variable injection signal output.

The translator logic circuits receive a 100-kHz reference input, a translator vco signal, and a bcd frequency input. The bcd frequency input is used to



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Synthesizer Decade, Block Diagram
Figure 2

program a variable frequency divider (division ratio depends on strapping and bcd inputs). The programmed variable frequency divider output (100 kHz) and the 100-kHz reference input are supplied to a phase/frequency discriminator that provides a control voltage proportional to the phase/frequency difference between its inputs.

The translator vco circuit receives the control voltage signal from the translator logic circuits and is driven to and phase-locked at the variable frequency as programmed by the variable divider bcd inputs to the translator logic circuits. The translator vco output is supplied to the translator logic circuits for clocking and lock signal generation. The translator vco output is supplied to the output mixer circuits for frequency mixing.

The output mixer circuit receives the translator signal input and the output vco signal input, mixes them, and supplies a reference input to the phase/frequency discriminator. In the phase/frequency discriminator the mixer reference input is compared with the high-reference input and produces an output control voltage.

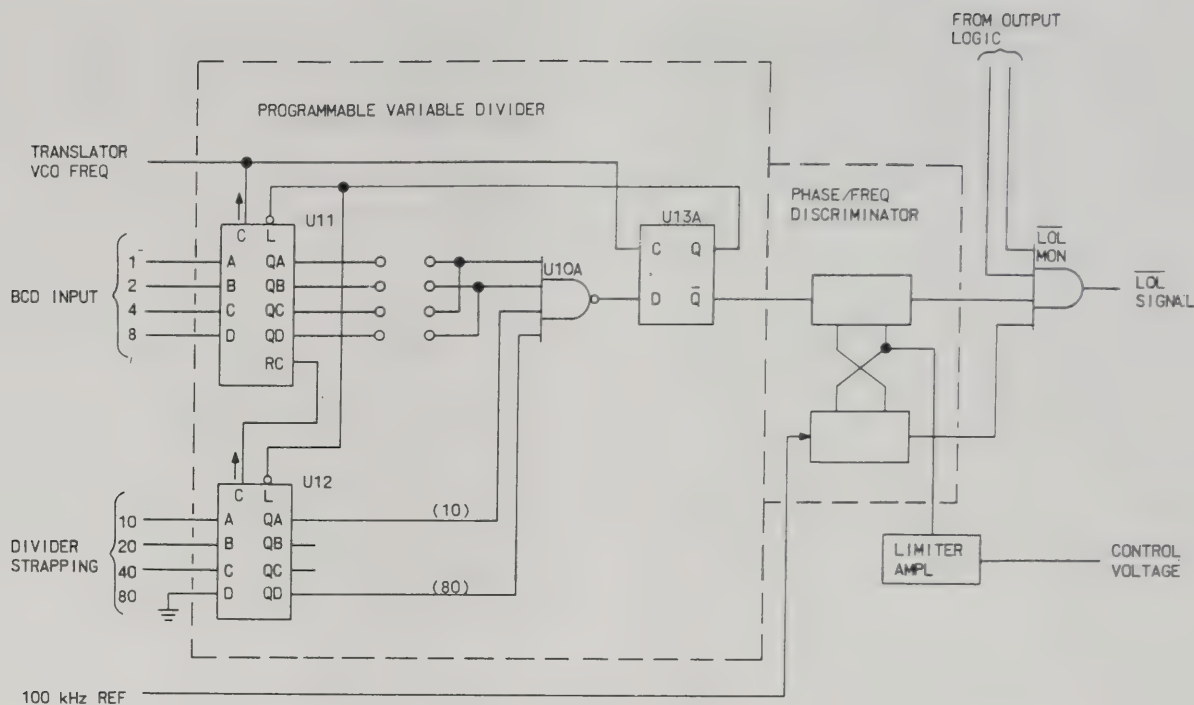
The output vco circuit receives the output control voltage signal from the output logic circuits and the

translator tracking voltage from the translator vco circuits. The translator tracking voltage provides a reference voltage for the output vco, and the output control voltage drives the output vco until it is locked at the variable injection frequency. The output vco output is supplied to a fixed divide-by-10 output circuit. The fixed divide-by-10 circuit output is supplied as a reference to the following decade or output module.

2.2 Translator Logic Circuits

The translator logic circuits receive a 100-kHz reference input, a translator vco signal output, and bcd frequency inputs, and supplies a control voltage output signal to the translator vco.

Refer to figure 3. The translator vco signal output (table 2) is supplied as the clock input to a programmable variable divider. The output of the programmable variable divider (100 kHz) is supplied to a phase/frequency discriminator and is compared with a 100-kHz reference input. A phase or frequency difference in the discriminator causes a control voltage input increase or decrease to adjust the frequency of the vco. If there is no phase or frequency difference, the discriminator provides a logic 1 lock signal output indicating the vco frequency is locked.



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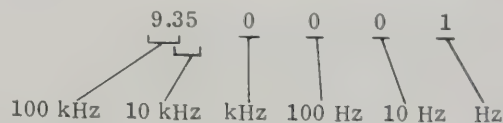
Translator Logic Circuits
Figure 3

Table 2. Decade Versus VCO Inputs/Outputs.

DECADE	TRANSLATOR VCO FREQ (MHz)	HIGH REF INPUT FREQ TO OUTPUT VCO (MHz)	OUTPUT VCO FREQ BEFORE DIVIDER (MHz)
100 kHz	9.5 to 8.6	0.85 to 0.750001	10.35 to 9.350001
10 kHz	7.8 to 6.9	0.70 to 0.60001	8.50 to 7.50001
1 kHz	6.4 to 5.5	0.60 to 0.5001	7.00 to 6.0001
100 Hz	5.4 to 4.5	0.60 to 0.501	6.00 to 5.001
10 Hz	5.4 to 4.5	0.60 to 0.51	6.00 to 5.01

Note

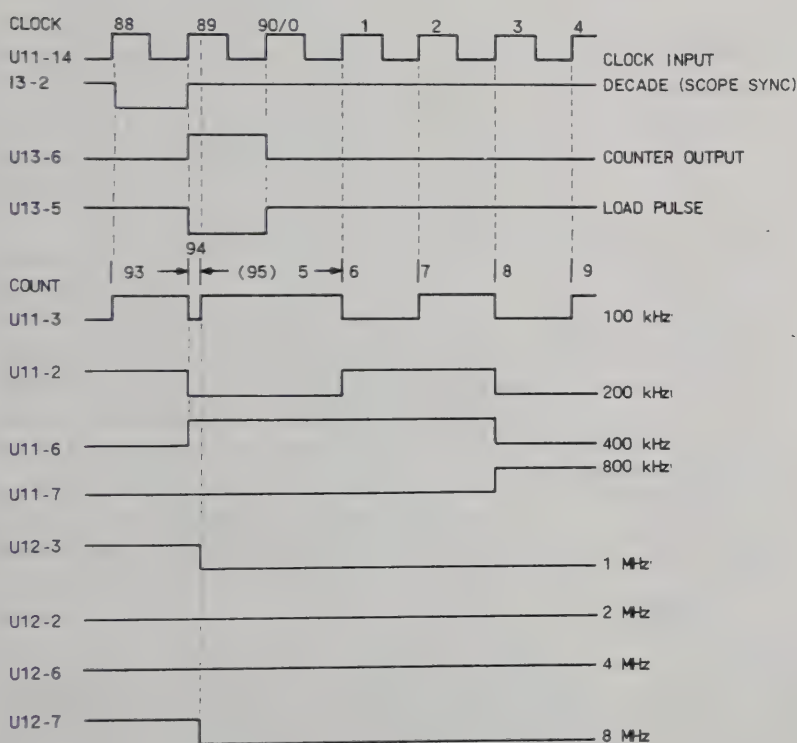
The above high-reference inputs are shown as they would be in a 1-Hz tuned synthesizer. In a 10-Hz tuned synthesizer, there would be no 10-Hz decade and the 100-Hz high-reference input would be 0.60 to 0.51 MHz, the 1-kHz high-reference input would be 0.60 to 0.501 MHz, etc. In a 100-Hz tuned synthesizer, there would be no 100-Hz decade and the 1-kHz high reference would be 0.60 to 0.51 MHz, the 10-kHz high reference would be 0.70 to 0.601 MHz, etc. Output vco frequency at 100-kHz output has the following tuning characteristics.



The programmable variable divider is programmed by the bcd frequency inputs. Refer to table 3. For example, if a bcd input of 0 is applied, the up/down decade counter is programmed to load the count 0 at any time a load signal (logic 0) is applied. This programs the variable divider to count from 0 (first count 1) to 95 (last count 95/0). This causes the output of the variable divider to be 1/95th of the clock input or a divide-by-95 with a bcd input of 0. Note that, as the bcd input goes up 1, 2, 3, etc, the division ratio goes down -94, -93, -92, etc. Also note that, for the divide-by circuit to operate as a constant, the last count 95 also must be the loaded count (in the case of bcd 0, count 0). To do this, prerecognition of count 95 is required. Look-ahead circuit of U10A performs this function. At clock 93 (count 93), gate U10A is ANDed and supplies a logic 0 input to U13A-D. With a logic 0 at U13A-D, clock 94 (count 94) causes U13A-Q to go to

logic 0 and loads decade counter to bcd input (ANDed output U10A is removed). At clock 94, U13A-Q supplies a pulse to the phase/frequency discriminator. Clock 95 (count 00) causes U13A-Q to go to logic 1 and enables decade counter to count on the next clock. Next clock is one above the bcd programmed input. Note that count 94 initiates the output from the divider and count 95 appears only as the bcd programmed input. Refer to figure 4. A 500-kHz programmed input is shown; the same principles apply to any other programmed bcd input.

The preceding discussion pertained to the 100-kHz decade card. Differences between the cards can be seen in figures 5 through 8 and tables 3 through 6. Note that the internal strapping changes and the external input divider strapping changes cause a change in the programmable variable divider.



PROGRAMMED BCD INPUTS		
100 kHz	PIN NO.	LOGIC LEVEL
1	U11 -15	1
2	U11 -1	0
4	U11 -10	1
8	U11 -9	0
10	U12 -15	FXD 0
20	U12 -1	FXD 0
40	U12 -10	FXD 0
80	U12 -9	FXD 0

NOTE:
EXAMPLE SHOWN IS FOR 500 kHz.

Variable Divider, Inputs and Outputs
Figure 4

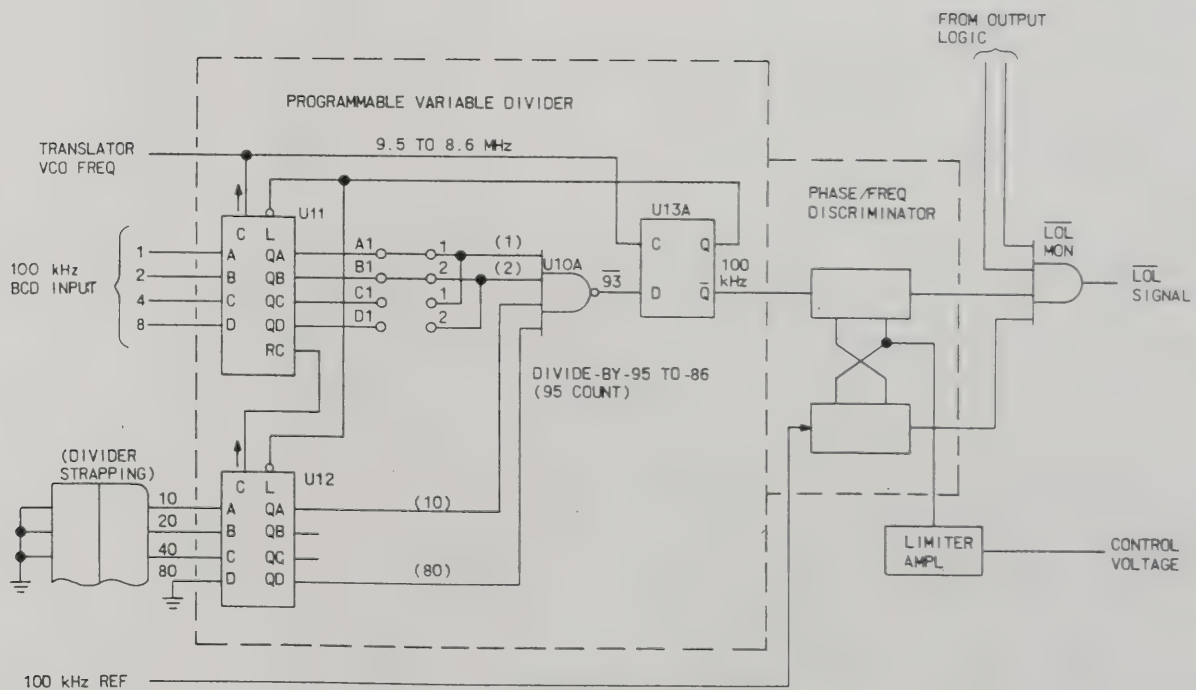
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Table 3. 100-kHz Decade, Logic Truth Table.

BCD INPUT (100 kHz)	DIVIDER INPUTS								OUTPUT COUNT	DIVIDE- BY	LOOP FREQ (MHz)
	U11				U12						
	A	B	C	D	**A	**B	**C	*D			
0	0	0	0	0	0	0	0	0	0	95	9.5
1	1	0	0	0	0	0	0	0	1	94	9.4
2	0	1	0	0	0	0	0	0	2	93	9.3
3	1	1	0	0	0	0	0	0	3	92	9.2
4	0	0	1	0	0	0	0	0	4	91	9.1
5	1	0	1	0	0	0	0	0	5	90	9.0
6	0	1	1	0	0	0	0	0	6	89	8.9
7	1	1	1	0	0	0	0	0	7	88	8.8
8	0	0	0	1	0	0	0	0	8	87	8.7
9	1	0	0	1	0	0	0	0	9	86	8.6

*Internally strapped for logic 0 (ground).

**Externally strapped for logic 0 (ground) at pins 7, 16, and 17.



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100-kHz Decade Translator, Logic Circuit
Figure 5

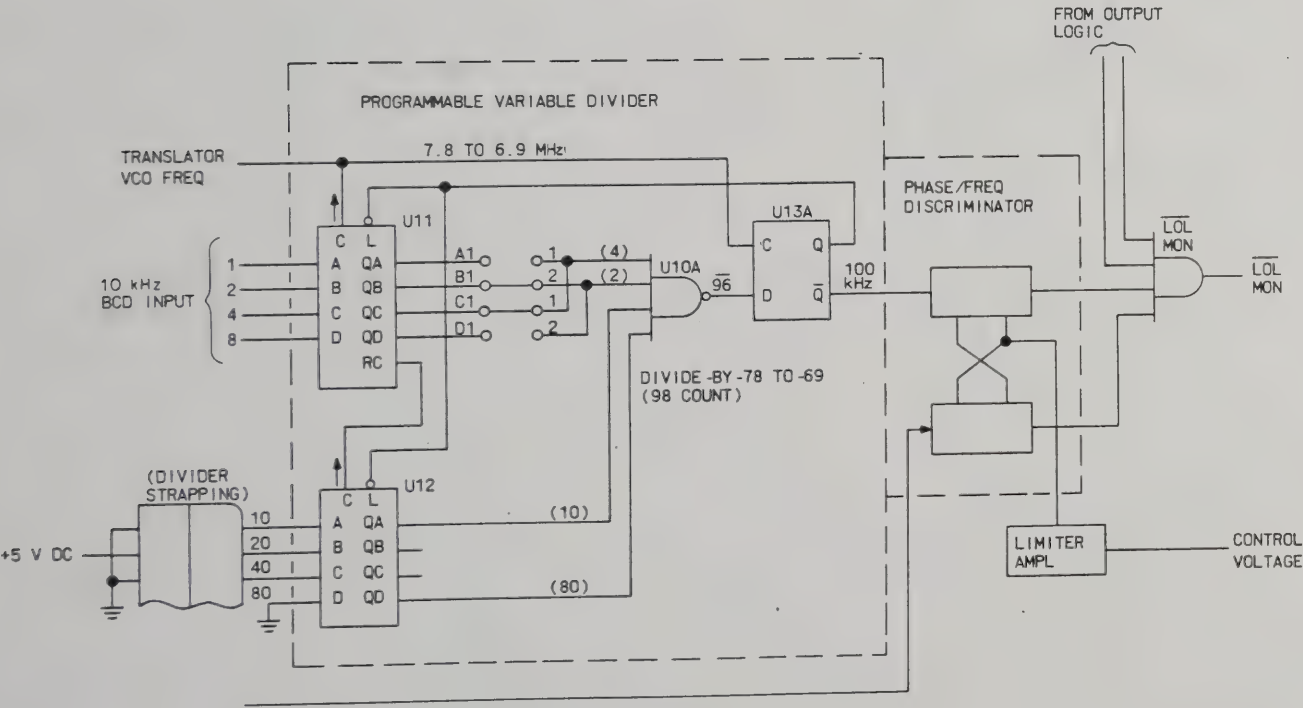
Table 4. 10-kHz Decade, Logic Truth Table.

BCD INPUT (10 kHz)	DIVIDER INPUTS								OUTPUT COUNT	DIVIDE- BY	LOOP FREQ (MHz)
	U11				U12						
	A	B	C	D	**A	¹ B	**C	*D			
0	0	0	0	0	0	1	0	0	20	78	7.8
1	1	0	0	0	0	1	0	0	21	77	7.7
2	0	1	0	0	0	1	0	0	22	76	7.6
3	1	1	0	0	0	1	0	0	23	75	7.5
4	0	0	1	0	0	1	0	0	24	74	7.4
5	1	0	1	0	0	1	0	0	25	73	7.3
6	0	1	1	0	0	1	0	0	26	72	7.2
7	1	1	1	0	0	1	0	0	27	71	7.1
8	0	0	0	1	0	1	0	0	28	70	7.0
9	1	0	0	1	0	1	0	0	29	69	6.9

*Internally strapped for logic 0 (ground).

**Externally strapped for logic 0 (ground) at pins 7 and 16.

¹Externally strapped for logic 1 (+5.2 V dc) at pin 17.



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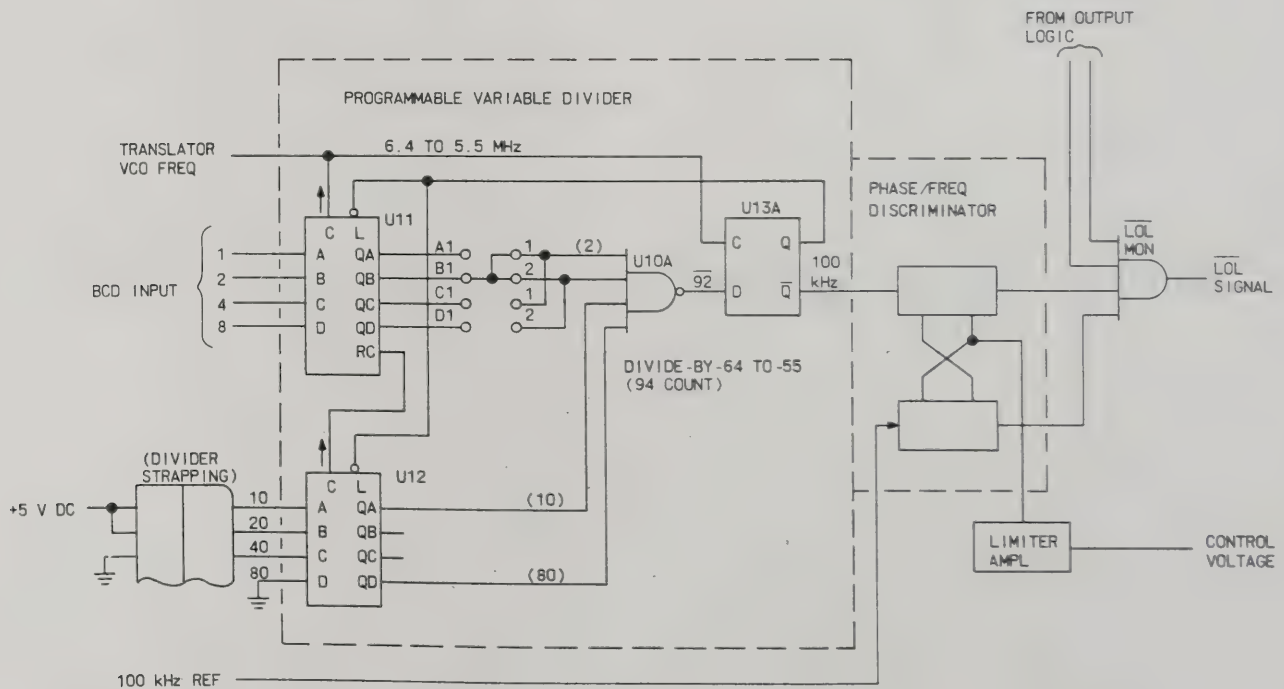
10-kHz Decade Translator, Logic Circuit
Figure 6

Table 5. 1-kHz Decade, Logic Truth Table.

BCD INPUT (1 kHz)	DIVIDER INPUTS								OUTPUT COUNT	DIVIDE- BY	LOOP FREQ (MHz)
	U11				U12						
	A	B	C	D	¹ A	¹ B	**C	*D			
0	0	0	0	0	1	1	0	0	30	64	6.4
1	1	0	0	0	1	1	0	0	31	63	6.3
2	0	1	0	0	1	1	0	0	32	62	6.2
3	1	1	0	0	1	1	0	0	33	61	6.1
4	0	0	1	0	1	1	0	0	34	60	6.0
5	1	0	1	0	1	1	0	0	35	59	5.9
6	0	1	1	0	1	1	0	0	36	58	5.8
7	1	1	1	0	1	1	0	0	37	57	5.7
8	0	0	0	1	1	1	0	0	38	56	5.6
9	1	0	0	1	1	1	0	0	39	55	5.5

*Internally strapped for logic 0 (ground).

**Externally strapped for logic 0 (ground) at pin 16.

¹Externally strapped for logic 1 (+5.2 V dc) at pins 7 and 17.

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1-kHz Decade Translator, Logic Circuit
Figure 7

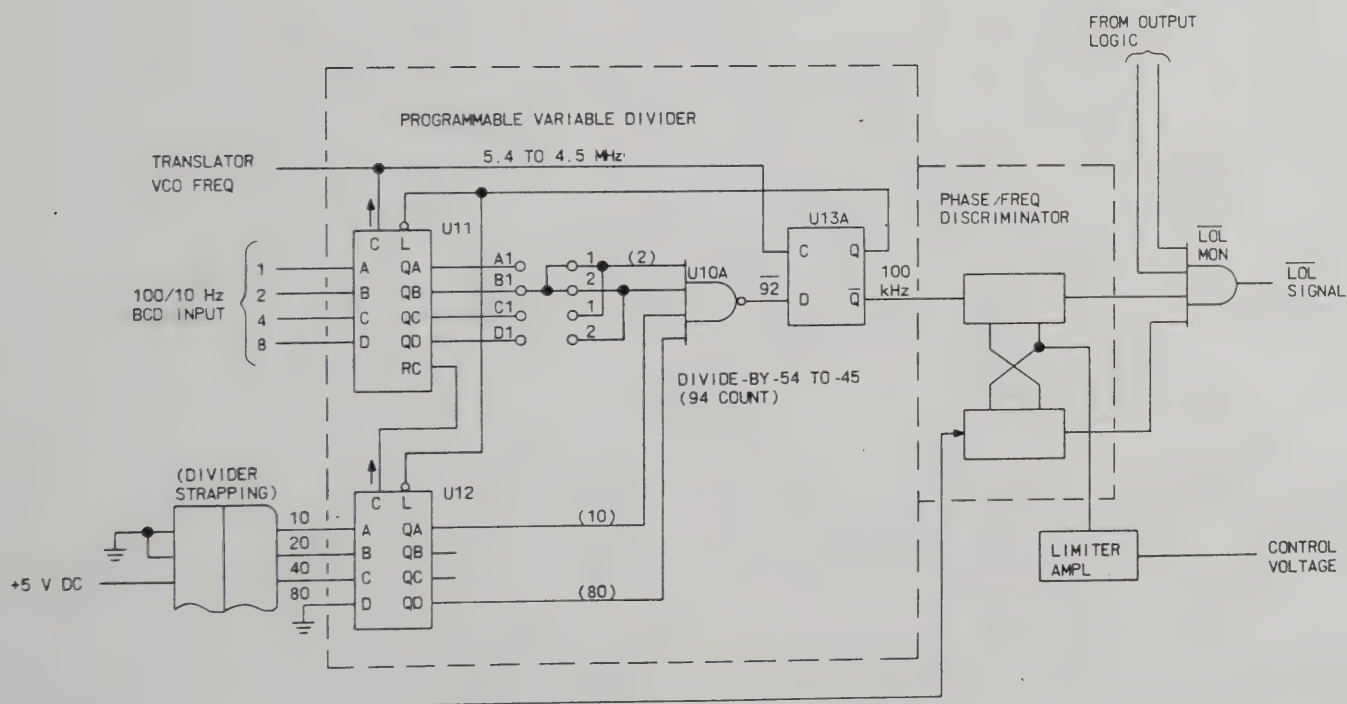
Table 6. 100/10-Hz Decade, Logic Truth Table.

BCD INPUT (100/10 Hz)	DIVIDER INPUTS								OUTPUT COUNT	DIVIDE- BY	LOOP FREQ (MHz)
	U11				U12						
	A	B	C	D	**A	**B	¹ C	*D			
0	0	0	0	0	0	0	1	0	40	54	5.4
1	1	0	0	0	0	0	1	0	41	53	5.3
2	0	1	0	0	0	0	1	0	42	52	5.2
3	1	1	0	0	0	0	1	0	43	51	5.1
4	0	0	1	0	0	0	1	0	44	50	5.0
5	1	0	1	0	0	0	1	0	45	49	4.9
6	0	1	1	0	0	0	1	0	46	48	4.8
7	1	1	1	0	0	0	1	0	47	47	4.7
8	0	0	0	1	0	0	1	0	48	46	4.6
9	1	0	0	1	0	0	1	0	49	45	4.5

*Internally strapped for logic 0 (ground).

**Externally strapped for logic 0 (ground) at pins 7 and 17.

¹Externally strapped for logic 1 (+5.2 V dc) at pin 16.



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100/10-Hz Decade Translator, Logic Circuit
Figure 8

2.3 Translator VCO Circuits

The translator vco circuits receive a control voltage from the translator logic circuits. The control voltage drives the vco to the required translator frequency. The translator signal output is supplied through one buffer amplifier to the output mixer circuits and the translator logic circuits.

2.4 Output Mixer Circuits

The output mixer circuits receive a translator signal input (table 2) from the translator vco. The translator vco signal is mixed with the output vco frequency (table 2) and a resulting difference frequency (table 2, same as high-reference input) is supplied to the output logic circuits.

2.5 Output Logic Circuits

The output logic circuits receive the output mixer difference frequency and a high-reference input signal (table 2), and supply a control voltage output signal to operate the output vco.

Refer to figure 9. The output mixer difference frequency is supplied through a squaring amplifier to a phase/frequency discriminator. This frequency is compared with the high-reference input signal. A phase or frequency difference in the discriminator causes the control voltage to increase or decrease to adjust the frequency of the vco. If there is no phase or frequency difference, the discriminator provides a logic 1 lock signal output and the vco frequency locks.

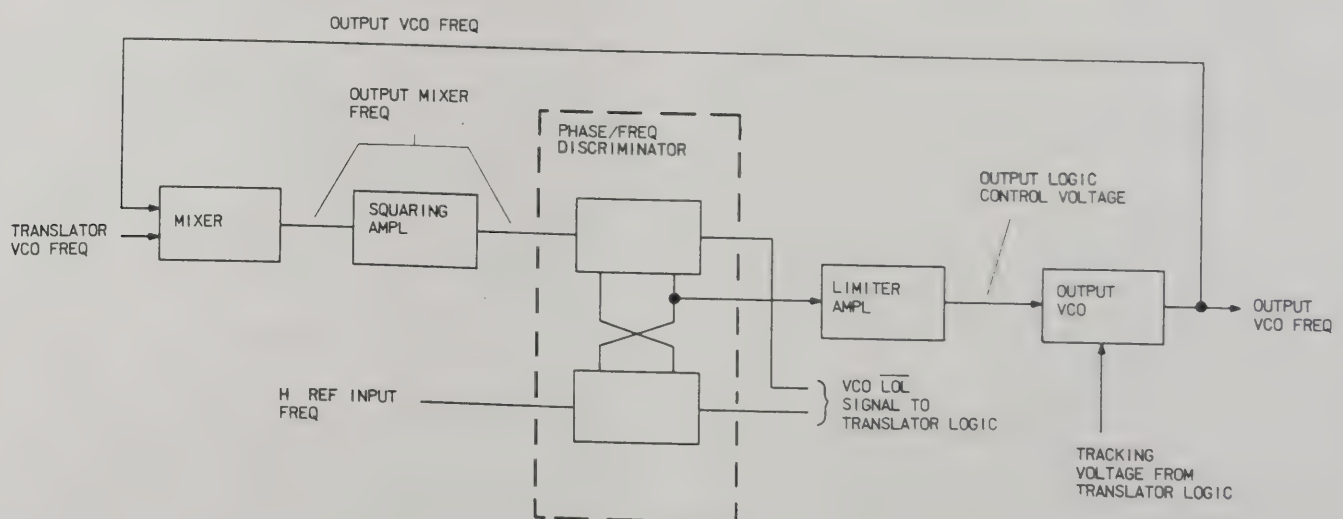
2.6 Output VCO Circuits

The output vco circuits receive a control voltage from the output logic circuits and a tracking voltage from the translator logic circuits. The tracking voltage from the translator logic circuits provides a reference for the output vco, and the control voltage from the output logic circuits drives the output vco to the required output vco frequency. The output vco frequency is supplied through a fixed divide-by-10 circuit and provides a reference frequency to the unit under control for additional frequency mixing and generation. Note that the tracking voltage from the translator logic circuits is used as a reference for the output vco, thus summing the translator frequency information and the output vco frequency information.

2.7 Up/Down Decade Counter 351-1527-040 (Refer to table 7)

The 351-1527-040 up/down decade counter is a 4-bit decade counter. Synchronous operation is provided by having all flip-flops clocked simultaneously so that the outputs change coincidentally with each other when input conditions are met.

A high at the enable input inhibits counting. A LOC at the enable input and a low-to-high clock transition triggers the four master/slave flip-flops. The enable input should be changed only when the clock is high. The down/up input determines the direction of the count. When low, the count goes up; when high, the count goes down.



Output Logic Circuits
Figure 9

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Table 7. Up/Down Decade Counter 351-1527-040,
Logic Truth Table.

PROGRAMMABLE INPUTS				COUNT	BCD OUTPUTS			
A	B	C	D		QA	QB	QC	QD
0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	0	0	0
0	1	0	0	2	0	1	0	0
1	1	0	0	3	1	1	0	0
0	0	1	0	4	0	0	1	0
1	0	1	0	5	1	0	1	0
0	1	1	0	6	0	1	1	0
1	1	1	0	7	1	1	1	0
0	0	0	1	8	0	0	0	1
1	0	0	1	9	1	0	0	1

E (enable): logic 0 enables counter; logic 1 inhibits counter.

L (load): logic 0 programs the bcd output count to be set at the bcd count of the programmable inputs; the next clock pulse counts one higher/lower (up/down).

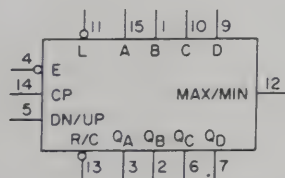
DU (down/up): logic 0 counts up; logic 1 counts down.

CP (clock pulse): logic 0-to-logic 1 transition advances counter.

RC (ripple clock): logic 0 pulse equal to 1/2 clock cycle when an overflow occurs.

MM (maximum/minimum count): logic 1 pulse equal to full clock cycle when an overflow or underflow occurs.

These counters are programmable. The outputs may be preset to any state by placing a low on the load input and entering the desired data at the data inputs. The output changes to agree with the data inputs independently of the state of the clock input. This allows the counters to be used as modulo-N dividers by modifying the count length with the preset inputs.



V_{CC} = PIN 16
GND = PIN 8

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Up/Down Decade Counter 351-1527-040
Figure 10

Two outputs are available to perform the cascading function: ripple clock and maximum/minimum count. The latter output produces a high level output pulse with a duration approximately equal to one complete cycle of the clock when the counter overflows or underflows. The ripple clock output produces a low-level output pulse equal in width to the low-level portion of the clock input when an overflow or underflow condition exists. The counters are cascaded by feeding the ripple clock output to the enable input of the succeeding counter if parallel clocking is used, or to the clock input if parallel enabling is used. The maximum/minimum count output can be used to accomplish look-ahead for high-speed operation.

2.3 Decade Counter 351-1636-010 (Refer to table 8.)

The 351-1636-010 decade counter is a high-speed, monolithic decade counter consisting of four dual-rack, master-slave flip-flops internally interconnected to provide a divide-by-2 counter and a divide-by-5 counter. Gated direct reset lines are provided to inhibit count inputs and return all outputs to a logical 0 or to a binary coded decimal (bcd) count of 9. As the output from flip-flop A is not internally connected to the succeeding stages, the count may be separated in three independent count modes.

- When used as a binary coded decimal decade counter, the BD input must be externally connected to the A output. The A input receives the incoming count, and a count sequence is obtained in accordance with the bcd count sequence in table 8. In addition to a conventional 0 reset, inputs are provided to reset a bcd 9 count for nine's complement decimal applications.
- If a symmetrical divide-by-10 count is desired for frequency synthesizers or other applications requiring division of a binary count by a power of 10, the D output must be externally connected to the A input. The input count is then applied at the BD input and a divide-by-10 square wave is obtained at output A.
- For operation as a divide-by-2 counter and divide-by-5 counter, no external interconnections are required. Flip-flop A is used as a binary element for the divide-by-2 function. The BD input is used to obtain binary divide-by-5 operation at the B, C, and D outputs. In this mode, the two counters operate independently; however, all four flip-flops are reset simultaneously.

Table 8. Decade Counter 351-1636-010, Logic Truth Table.

*BCD COUNT SEQUENCE				
COUNT	OUTPUT			
	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

**RESET/COUNT				
RESET INPUTS				OUTPUT
R ₀₍₁₎	R ₀₍₂₎	R ₉₍₁₎	R ₉₍₂₎	D C B A
1	1	0	X	0 0 0 0
1	1	X	0	0 0 0 0
X	X	1	1	1 0 0 1
X	0	X	0	Count
0	X	0	X	Count
0	X	X	0	Count
X	0	0	X	Count

*Output A connected to input BD for BCD count.
 **X indicates that either a logical 1 or a logical 0 may be present.

2.9 Dual D-Type Flip-Flop With Preset and Clear 351-1525-040 (Refer to table 9)

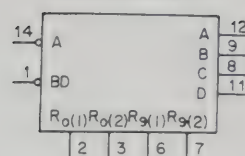
The 351-1525-040 consists of dual high-speed D-type flip-flops. Information on the D input is transferred to the Q output on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level of the clock pulse and is not directly related to the transition time of the positive-going pulse. When the clock input is at either high or low level, the D-input signal has no effect.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the synthesizer decade are listed in the maintenance section of this instruction book.

LOGIC SYMBOL

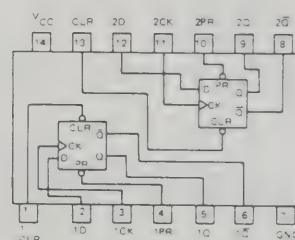


TP5-2326-012

Decade Counter 351-1636-010
Figure 11

3.2 Testing

The test procedures in table 10 check total performance of the synthesizer decade. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.



TP5-2327-010

Dual D-Type Flip-Flop With Preset
and Clear 351-1525-040
Figure 12

Table 9. Dual D-Type Flip-Flop With Preset and Clear 351-1525-040, Logic Truth Table.

INPUTS				OUTPUTS	
PRESET	CLEAR	CLOCK	D	Q	$\bar{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	*H	*H
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q ₀	$\bar{Q}_0$

H = high level (steady state)
 L = low level (steady state)
 X = irrelevant
 ↑ = transition from low to high level
 Q₀ = the level of Q before the indicated input conditions were established.
 * This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (high) level.

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of the unit containing the synthesizer decade that is to be tested. b. Remove cover from the synthesizer section of the unit. c. Remove synthesizer decade and install it on an extender card and place it in the unit. d. Set unit LINE SELECTOR switch to 115 V. e. Connect unit to 115-V ac power source and set power on. f. Measure dc voltage from P1-20 and P1-2 to P1-6 (ground). g. Measure dc voltage from P1-10 to P1-6 (ground).	+5.2 $\pm$ 0.2 V dc. NLT +19.5 V dc, NMT +20.8 V dc.	Check unit synthesizer voltage regulator. Check unit synthesizer voltage regulator.
2. 100-kHz decade 623-2080-001	Note CR1, CR2, CR3, and CR4 are located under metal can shields. These shields must be in place during testing and adjustments. Refer to figure 13 for test point locations on the rear of the synthesizer decade. a. Using a frequency counter, measure the high reference input between P1-14 and P1-4 (ground). b. Set FREQUENCY KHZ control on front panel to 09900.00 (or 09900.0). c. Measure the dc voltage at the cathode end of CR3-CR4. (Refer to note and chart at end of test 2 for voltages and output frequencies at different 100-kHz settings.) d. Using a frequency counter, measure the output between P1-1 and P1-11 (ground).	800 $\pm$ 50 kHz. Note actual frequency. 10.0 $\pm$ 0.1 V dc. 940 $\pm$ 5 kHz. (Actual should equal 935 kHz plus one-tenth of the difference between 850 kHz and the actual frequency in step a.)	Check unit 10-kHz decade. Adjust L9 for 10.0 $\pm$ 0.1 V dc. If L9 adjustment does not correct the problem, check Q4, Q5, and associated circuit. Adjust L7 for actual frequency required with 1.5 V dc at anode end of CR1-CR2. If L7 adjustment does not correct the problem, check Q1, Q2, and associated circuits.
(Cont)			

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	e. Measure the dc voltage at the anode end of CR1-CR2. f. Note the dc voltage at the anode end of the anode end of CR1-CR2 while moving the 100-kHz frequency control from 9 down to 0. g. Set FREQUENCY KHZ control on front panel to 09000.00 (or 09000.0). h. Using a frequency counter, measure the high reference input between P1-14 and P1-4 (ground). i. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). j. Set FREQUENCY KHZ control on front panel to 09900.00 (or 09900.0). k. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). l. Measure the dc voltage at P1-12 to ground. m. Ground P1-5 while noting the voltage at P1-12. n. Remove P1-5 ground. o. Set front-panel PWR switch off. p. Remove 10-kHz decade from unit under test. q. Set front-panel PWR switch on. r. Measure the dc voltage at P1-12 to ground. s. Set front-panel PWR switch off.	1.5 $\pm$0.5 V dc. NLT 1.0 V dc and NMT 2.0 V dc at any frequency control setting. 850 $\pm$0.5 kHz. 1035 $\pm$0.5 kHz. 945 $\pm$0.5 kHz. NLT +3.5 V dc. NMT 0.5 V dc. NMT 0.5 V dc.	Same as step d. Adjust L7 so that all settings fall into the 1.0- to 2.0-V dc reading. Check unit 10-kHz decade. Check U11, U12, U13, and associated circuits. Check U11, U12, U13, and associated circuits. Check U3, U8, U9, and U10. Check U6, U7, U8, U9, and U10. Check U1, U2, U3, and U10.

Note

RCV FAULT,
EXCTR FAULT,
or R/E FAULT
indicator lighting
indicates that
result of step m
is satisfactory.

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL																																	
2. (Cont)	t. Replace 10-kHz decade in unit under test. Note The following chart is shown with an input frequency of 850 ±5 kHz. The actual output frequency with any input frequency can be determined using the following formula. $AF = LF - 10 \text{ kHz} + \frac{850 \text{ kHz} - IF}{10}$ AF = actual output frequency at P1-1. LF = output frequency listed in chart for associated 100-kHz frequency digit. IF = actual input frequency. <table><tr><th>100-kHz FREQ DIGIT</th><th>CR3-CR4 DC VOLTAGE</th><th>FREQ OUTPUT P1-1 (kHz)</th></tr><tr><td>9</td><td>10.00 ±0.1</td><td>945 ±0.5</td></tr><tr><td>8</td><td>*10.30</td><td>955 ±0.5</td></tr><tr><td>7</td><td>*10.55</td><td>965 ±0.5</td></tr><tr><td>6</td><td>*10.85</td><td>975 ±0.5</td></tr><tr><td>5</td><td>*11.15</td><td>985 ±0.5</td></tr><tr><td>4</td><td>*11.40</td><td>995 ±0.5</td></tr><tr><td>3</td><td>*11.70</td><td>1005 ±0.5</td></tr><tr><td>2</td><td>*11.95</td><td>1015 ±0.5</td></tr><tr><td>1</td><td>*12.25</td><td>1025 ±0.5</td></tr><tr><td>0</td><td>*12.50</td><td>1035 ±0.5</td></tr></table> Note Table shown with an input frequency of 850 ±5 kHz [front-panel FREQUENCY KHZ setting of 09X00.00 (or 09X00.0)]. *Reference voltage only. Voltages will vary from board to board.	100-kHz FREQ DIGIT	CR3-CR4 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)	9	10.00 ±0.1	945 ±0.5	8	*10.30	955 ±0.5	7	*10.55	965 ±0.5	6	*10.85	975 ±0.5	5	*11.15	985 ±0.5	4	*11.40	995 ±0.5	3	*11.70	1005 ±0.5	2	*11.95	1015 ±0.5	1	*12.25	1025 ±0.5	0	*12.50	1035 ±0.5		
100-kHz FREQ DIGIT	CR3-CR4 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)																																		
9	10.00 ±0.1	945 ±0.5																																		
8	*10.30	955 ±0.5																																		
7	*10.55	965 ±0.5																																		
6	*10.85	975 ±0.5																																		
5	*11.15	985 ±0.5																																		
4	*11.40	995 ±0.5																																		
3	*11.70	1005 ±0.5																																		
2	*11.95	1015 ±0.5																																		
1	*12.25	1025 ±0.5																																		
0	*12.50	1035 ±0.5																																		
3. 10-kHz decade 623-2080-002	Note CR1, CR2, CR3, and CR4 are located under metal can shields. These shields must be in place during testing and adjustments. Refer to figure 13 for test point locations on the rear of the synthesizer decade. a. Using a frequency counter, measure the high reference input between P1-14 and P1-4 (ground). b. Set FREQUENCY KHZ control on front panel to 09990.00 (or 09990.0).	650 ±50 kHz. Note actual frequency.	Check unit 1-kHz decade.																																	
(Cont)																																				

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	c. Measure the dc voltage at the cathode end of CR3-CR4 (refer to note and chart at end of test 3 for voltages and output frequencies at different 10-kHz settings). d. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). e. Measure the dc voltage at the anode end of CR1-CR2. f. Note the dc voltage of the anode end of CR1-CR2 while moving the 10-kHz frequency control from 9 down to 0. g. Set FREQUENCY KHZ control on front panel to 09900.00 (or 09900.0). h. Using a frequency counter, measure the high reference input between P1-14 and P1-4 (ground). i. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). j. Set FREQUENCY KHZ control on front panel to 09990.00 (or 09990.0). k. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). l. Measure the dc voltage at P1-12 to ground.	10.45 $\pm$0.1 V dc. 755 $\pm$5 kHz. (Actual should equal 750 kHz plus one-tenth of the difference between 700 kHz and the actual frequency in step a.) 1.5 $\pm$0.5 V dc. NLT 1.0 V dc and NMT 2.0 V dc at any frequency control setting. 700 $\pm$0.5 kHz. 850 $\pm$0.5 kHz. 760 $\pm$0.5 kHz. NLT +3.5 V dc.	Adjust L9 for 10.00 $\pm$0.1 V dc. If L9 adjustment does not correct the problem, check Q4, Q5, and associated circuit. Adjust L7 for actual frequency required with 1.5 V dc at anode end of CR1-CR2. If L7 adjustment does not correct the problem, check Q1, Q2, and associated circuits. Same as step d. Adjust L7 so that all settings fall into the 1.0- to 2.0-V dc reading. Check unit 1-kHz decade. Check U11, U12, U13, and associated circuits. Check U11, U12, U13, and associated circuits. Check U3, U8, U9, and U10.
(Cont)	m. Ground P1-5 while noting the voltage at P1-12.	NMT 0.5 V dc. Note RCV FAULT, EXCTR FAULT, or R/E FAULT indicator lighting indicates that result of step m is satisfactory.	Check U6, U7, U8, U9, and U10.

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																	
3. (Cont)	n. Remove P1-5 ground. o. Set front-panel PWR switch off. p. Remove 1-kHz decade from unit under test. q. Set front-panel PWR switch on. r. Measure the dc voltage at P1-12 to ground. s. Set front-panel PWR switch off. t. Replace 1-KHZ decade in unit under test.	NMT 0.5 V dc.	Check U1, U2, U3, and U10.																																	
Note The following chart is shown with an input frequency of 700 ±5 kHz. The actual output frequency with any input frequency can be determined using the following formula. $AF = LF - 10 \text{ kHz} + \frac{700 \text{ kHz} - IF}{10}.$ AF = actual output frequency at P1-1. LF = output frequency listed in chart for associated 10-kHz frequency digit. IF = actual input frequency. <table><tr><th>10-kHz FREQ DIGIT</th><th>CR3-CR4 DC VOLTAGE</th><th>FREQ OUTPUT P1-1 (kHz)</th></tr><tr><td>9</td><td>10.00 ±0.1</td><td>760 ±0.5</td></tr><tr><td>8</td><td>*10.30</td><td>770 ±0.5</td></tr><tr><td>7</td><td>*10.55</td><td>780 ±0.5</td></tr><tr><td>6</td><td>*10.85</td><td>790 ±0.5</td></tr><tr><td>5</td><td>*11.10</td><td>800 ±0.5</td></tr><tr><td>4</td><td>*11.40</td><td>810 ±0.5</td></tr><tr><td>3</td><td>*11.75</td><td>820 ±0.5</td></tr><tr><td>2</td><td>*12.00</td><td>830 ±0.5</td></tr><tr><td>1</td><td>*12.35</td><td>840 ±0.5</td></tr><tr><td>0</td><td>*12.65</td><td>850 ±0.5</td></tr></table> Note Table shown with an input frequency of 700 ±5 kHz [front-panel FREQUENCY KHZ setting of 099X0.00 (or 099X0.0)]. *Reference voltage only. Voltages will vary from board to board.				10-kHz FREQ DIGIT	CR3-CR4 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)	9	10.00 ±0.1	760 ±0.5	8	*10.30	770 ±0.5	7	*10.55	780 ±0.5	6	*10.85	790 ±0.5	5	*11.10	800 ±0.5	4	*11.40	810 ±0.5	3	*11.75	820 ±0.5	2	*12.00	830 ±0.5	1	*12.35	840 ±0.5	0	*12.65	850 ±0.5
10-kHz FREQ DIGIT	CR3-CR4 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)																																		
9	10.00 ±0.1	760 ±0.5																																		
8	*10.30	770 ±0.5																																		
7	*10.55	780 ±0.5																																		
6	*10.85	790 ±0.5																																		
5	*11.10	800 ±0.5																																		
4	*11.40	810 ±0.5																																		
3	*11.75	820 ±0.5																																		
2	*12.00	830 ±0.5																																		
1	*12.35	840 ±0.5																																		
0	*12.65	850 ±0.5																																		

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. 1-kHz decade 623-2080-003	Note CR1, CR2, CR3, and CR4 are located under metal can shields. These shields must be in place during testing and adjustments. Refer to figure 13 for test point locations on the rear of the synthesizer decade. a. Using a frequency counter, measure the high reference input between P1-14 and P1-4 (ground). b. Set FREQUENCY KHZ control on front panel to 09999.00 (or 09999.0). c. Measure the dc voltage at the cathode end of CR3-CR4 (refer to note and chart at end of test 4 for voltages and output frequencies at different 1-kHz settings). d. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). e. Measure the dc voltage at the anode end of CR1-CR2. f. Note the dc voltage at the anode end of CR1-CR2 while moving the 1-kHz frequency control from 9 down to 0. g. Set FREQUENCY KHZ control on front panel to 09990.00 (or 09990.0). h. Using a frequency counter, measure the high reference input between P1-14 and P1-4 (ground). i. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). j. Set FREQUENCY KHZ control on front panel to 09999.00 (or 09999.0).	550 $\pm$50 kHz. Note actual frequency. 10.0 $\pm$0.1 V dc. 605 $\pm$5 kHz. (Actual should equal 600 kHz plus one-tenth of the difference between 610 kHz and the actual frequency in step a.) 1.5 $\pm$0.5 V dc. NLT 1.0 V dc and NMT 2.0 V dc at any frequency control setting. 600 $\pm$0.5 kHz. 700 $\pm$0.5 kHz.	Check unit 100-kHz decade. Adjust L9 for 10.0 $\pm$0.1 V dc. If L9 adjustment does not correct the problem, check Q4, Q5, and associated circuit. Adjust L7 for actual frequency required with 1.5 V dc at anode end of CR1-CR2. If L7 adjustment does not correct the problem, check Q1, Q2, and associated circuits. Same as step d. Adjust L7 so that all settings fall into the 1.0- to 2.0-V reading. Check unit 100-kHz decade. Check U11, U12, U13, and associated circuits.
(Cont)			

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. (Cont)	k. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). l. Measure the dc voltage at P1-12 to ground. m. Ground P1-5 while noting the voltage at P1-12. n. Remove P1-5 ground. o. Set front-panel PWR switch off. p. Remove decade in 100-Hz slot (A18) from unit under test. q. Set front-panel PWR switch on. r. Measure the dc voltage at P1-12 to ground. s. Set front-panel PWR switch off. t. Replace decade in 100-Hz slot (A18) in unit under test.	610 $\pm$0.5 kHz. NLT +3.5 V dc. Note RCV FAULT, EXCTR FAULT, or R/E FAULT indicator lighting indicates that result of step m is satisfactory. NMT 0.5 V dc. NMT 0.5 V dc.	Check U11, U12, U13, and associated circuits. Check U3, U8, U9, and U10. Check U6, U7, U8, U9, and U10. Check U1, U2, U3, and U10.
(Cont)	Note The following chart is shown with an input frequency of 600 $\pm$5 kHz. The actual output frequency with any input frequency can be determined using the following formula. $AF = LF - 10 \text{ kHz} + \frac{600 \text{ kHz} - IF}{10}.$ AF = actual output frequency at P1-1. LF = output frequency listed in chart for associated 1-kHz frequency digit. IF = actual input frequency.		

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

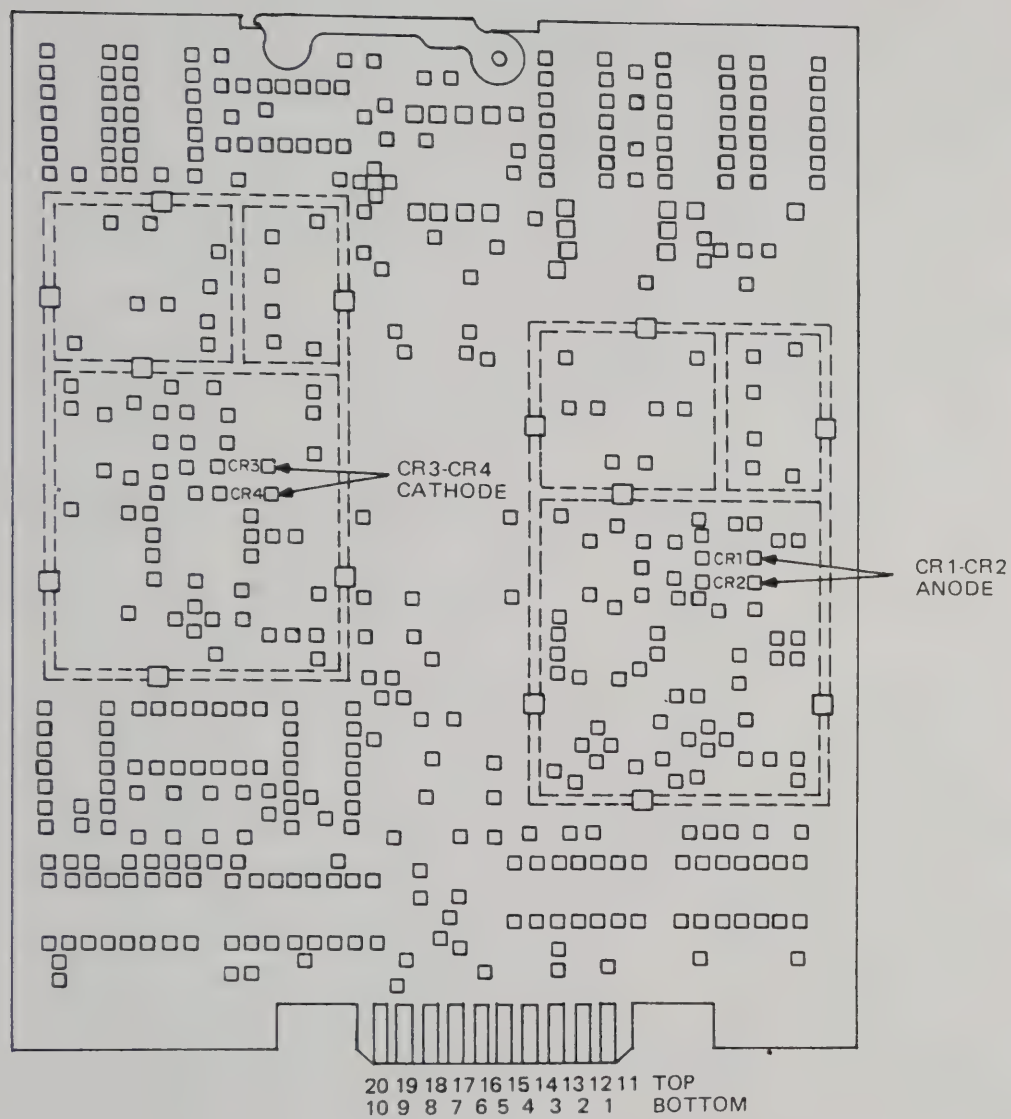
TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																	
4. (Cont)	<table><tr><th>1-kHz FREQ DIGIT</th><th>CR3-CR4 DC VOLTAGE</th><th>FREQ OUTPUT P1-1 (kHz)</th></tr><tr><td>9</td><td>10.00 ±0.1</td><td>610 ±0.5</td></tr><tr><td>8</td><td>*10.40</td><td>620 ±0.5</td></tr><tr><td>7</td><td>*10.85</td><td>630 ±0.5</td></tr><tr><td>6</td><td>*11.25</td><td>640 ±0.5</td></tr><tr><td>5</td><td>*11.70</td><td>650 ±0.5</td></tr><tr><td>4</td><td>*12.10</td><td>660 ±0.5</td></tr><tr><td>3</td><td>*12.55</td><td>670 ±0.5</td></tr><tr><td>2</td><td>*12.95</td><td>680 ±0.5</td></tr><tr><td>1</td><td>*13.40</td><td>690 ±0.5</td></tr><tr><td>0</td><td>*13.80</td><td>700 ±0.5</td></tr></table> Note Table shown with an input frequency of 600 ±5 kHz [front-panel FREQUENCY KHZ setting of 0999X.00 (or 0999X.0)]. *Reference voltage only. Voltages will vary from board to board.	1-kHz FREQ DIGIT	CR3-CR4 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)	9	10.00 ±0.1	610 ±0.5	8	*10.40	620 ±0.5	7	*10.85	630 ±0.5	6	*11.25	640 ±0.5	5	*11.70	650 ±0.5	4	*12.10	660 ±0.5	3	*12.55	670 ±0.5	2	*12.95	680 ±0.5	1	*13.40	690 ±0.5	0	*13.80	700 ±0.5		
1-kHz FREQ DIGIT	CR3-CR4 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)																																		
9	10.00 ±0.1	610 ±0.5																																		
8	*10.40	620 ±0.5																																		
7	*10.85	630 ±0.5																																		
6	*11.25	640 ±0.5																																		
5	*11.70	650 ±0.5																																		
4	*12.10	660 ±0.5																																		
3	*12.55	670 ±0.5																																		
2	*12.95	680 ±0.5																																		
1	*13.40	690 ±0.5																																		
0	*13.80	700 ±0.5																																		
5. 100/10-Hz decade 623-2080-004	Note CR1, CR2, CR3, and CR4 are located under metal can shields. These shields must be in place during testing and adjustments. Refer to figure 13 for test-point locations on the rear of the synthesizer decade. a. Using a frequency counter, measure the high reference input between P1-14 and P1-4 (ground). b. If decade installed in 100-Hz slot (A18), set FREQUENCY KHZ control to 09999.90 (or 09999.9). If decade installed in 10-Hz slot (A17), set FREQUENCY KHZ control to 09999.99. c. Measure the dc voltage at the cathode end of CR3-CR4 (refer to note and chart at end of test 5 for voltages and output frequencies at different 100- or 10-Hz settings).	550 ±50 kHz. Note actual frequency. 																																		

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	d. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). e. Measure the dc voltage at the anode end of CR1-CR2. f. Note the dc voltage at the anode end of CR1-CR2 while moving the 100- or 10-Hz frequency control from 9 down to 0 (Change 100-Hz decade or 10-Hz control if installed as 100-Hz decade or 10-Hz control if installed as 10-Hz decade). g. If decade installed in 100-Hz slot (A18), set FREQUENCY KHZ control on front panel to 09999.00 (or 09999.0). If decade installed in 10-Hz slot, set FREQUENCY KHZ control on front panel to 09999.90. h. Using a frequency counter, measure the high reference input between P1-14 and P1-4 (ground). i. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). j. If decade installed in 100-Hz slot (A18), set FREQUENCY KHZ control on front panel to 09999.90 (or 09999.9). If decade installed in 10-Hz slot (A18), set FREQUENCY KHZ control on front panel to 09999.99. k. Using a frequency counter, measure the output between P1-1 and P1-11 (ground). l. Measure the dc voltage at P1-12 to ground.	515 $\pm$ 5 kHz. (Actual should equal 510 kHz plus one-tenth of the difference between 600 kHz and the actual frequency in step a.) 1.5 $\pm$ 0.5 V dc. NLT 1.0 V dc and NMT 2.0 V dc at any frequency control setting. 600 $\pm$ 0.5 kHz. 600 $\pm$ 0.5 kHz. 510 $\pm$ 0.5 kHz. NLT +3.5 V dc.	Adjust L7 for actual frequency required with 1.5 V dc at anode end of CR1-CR2. If L7 adjustment does not correct the problem, check Q1, Q2, and associated circuits. Same as step d. Adjust L7 so that all settings fall into the 1.0- to 2.0-V dc reading. Check unit 10-Hz decade or end decade. Check U11, U12, U13, and associated circuits. Check U11, U12, U13, and associated circuits. Check U3, U8, U9, and U10.
(Cont)	m. Ground P1-5 while noting the voltage at P1-12.	NMT 0.5 V dc. Note RCV FAULT, EXCTR FAULT, or R/E FAULT indicator lighting indicates that result of step m is satisfactory.	Check U6, U7, U8, U9, and U10.

Table 10. Synthesizer Decade, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL																																	
5. (Cont)	n. Remove P1-5 ground. o. Set front-panel PWR switch off. p. If testing decade installed in 100-Hz slot (A18), remove decade in 10-Hz (A17) slot from unit under test. If testing decade installed in 10-Hz slot (A17), remove end decade from unit under test. q. Set front-panel PWR switch on. r. Measure the dc voltage at P1-12 to ground. s. Set front-panel PWR switch off. t. Replace decade that was removed in step p. The following chart is shown with an input frequency of 600 ±5 kHz. The actual output frequency with any input frequency can be determined using the following formula. $AF = LF - 10 \text{ kHz} + \frac{600 \text{ kHz} - IF}{10}.$ AF = actual output frequency at P1-1. LF = output frequency listed in chart for associated 100- or 10-Hz frequency digit. IF = actual input frequency. <table><thead><tr><th>*100/10-Hz FREQ DIGIT</th><th>CR3-CR4 DC VOLTAGE</th><th>FREQ OUTPUT P1-1 (kHz)</th></tr></thead><tbody><tr><td>9</td><td>10.0 ±0.1</td><td>510 ±0.5</td></tr><tr><td>8</td><td>**10.5</td><td>520 ±0.5</td></tr><tr><td>7</td><td>**11.0</td><td>530 ±0.5</td></tr><tr><td>6</td><td>**11.5</td><td>540 ±0.5</td></tr><tr><td>5</td><td>**12.0</td><td>550 ±0.5</td></tr><tr><td>4</td><td>**12.5</td><td>560 ±0.5</td></tr><tr><td>3</td><td>**13.0</td><td>570 ±0.5</td></tr><tr><td>2</td><td>**13.5</td><td>580 ±0.5</td></tr><tr><td>1</td><td>**14.0</td><td>590 ±0.5</td></tr><tr><td>0</td><td>**14.5</td><td>600 ±0.5</td></tr></tbody></table> *If decade installed in 100-Hz (A18) slot, 100-Hz frequency digit position. If decade installed in 10-Hz (A17) slot, 10-Hz frequency digit position. **Reference voltage only. Voltages will vary from board to board. Note Table shown with an input frequency of 600 ±5 kHz.	*100/10-Hz FREQ DIGIT	CR3-CR4 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)	9	10.0 ±0.1	510 ±0.5	8	**10.5	520 ±0.5	7	**11.0	530 ±0.5	6	**11.5	540 ±0.5	5	**12.0	550 ±0.5	4	**12.5	560 ±0.5	3	**13.0	570 ±0.5	2	**13.5	580 ±0.5	1	**14.0	590 ±0.5	0	**14.5	600 ±0.5	NMT 0.5 V dc.	Check U1, U2, U3, and U10.
*100/10-Hz FREQ DIGIT	CR3-CR4 DC VOLTAGE	FREQ OUTPUT P1-1 (kHz)																																		
9	10.0 ±0.1	510 ±0.5																																		
8	**10.5	520 ±0.5																																		
7	**11.0	530 ±0.5																																		
6	**11.5	540 ±0.5																																		
5	**12.0	550 ±0.5																																		
4	**12.5	560 ±0.5																																		
3	**13.0	570 ±0.5																																		
2	**13.5	580 ±0.5																																		
1	**14.0	590 ±0.5																																		
0	**14.5	600 ±0.5																																		



TP5-3056-011

Synthesizer Decade, Rear View
Figure 13

4. ALIGNMENT/ADJUSTMENT

4.1 L7 and L9 Selection, and Decade Strapping

Note

L7 and L9 can be replaced only by removing the metal cans that cover them. In emergency repairs L7, L9, and strapping can be changed on any synthesizer decade 623-2080- () to make the required decade (100 kHz, 10 kHz, 1 kHz, or 100/10 Hz). When L7, L9, and straps are installed as follows the indicated decade is constructed. Testing and adjustments must be made to ensure proper operation.

4.1.1 100-kHz Decade 623-2080-001

- Install L7, 6.75 to 11.25 μ H, (242-0441-030).
- Install L9, 6.75 to 11.25 μ H, (242-0441-030).
- Strap A to 1 and B to 2.

4.1.2 10-kHz Decade 623-2080-002

- Install L7, 6.75 to 11.25 μ H, (242-0441-030).
- Install L9, 12.0 to 18.0 μ H, (242-0441-040).
- Strap B to 2 and C to 1.

4.1.3 1-kHz Decade 623-2080-003

- Install L7, 12.0 to 18.0 μ H, (242-0441-040).
- Install L9, 20.8 to 31.2 μ H, (242-0441-050).
- Strap B to 2 and 1 to 2.

4.1.4 100/10-Hz Decade 623-2080-004

- Install L7, 20.8 to 31.2 μ H, (242-0441-050).
- Install L9, 20.8 to 31.2 μ H, (242-0441-050).
- Strap B to 2 and 1 to 2.

4.2 Adjustment of L7 and L9

Note

If either L7 or L9 is replaced, both must be adjusted. Metal can shields must be installed before making these adjustments.

Refer to table 8. Perform the test procedures applicable to the associated decade.

- For L7 and L9 adjustment in 100-kHz decade, perform test 2, steps a through d.

- For L7 and L9 adjustment in 10-kHz decade, perform test 3, steps a through d.
- For L7 and L9 adjustment in 1-kHz decade, perform test 4, steps a through d.
- For L7 and L9 adjustment in 100/10-Hz decade, perform test 5, steps a through d.

5. REPAIR

Repair of the synthesizer decade is accomplished using the standard planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 14). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts' location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the **DESCRIPTION** column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the **EFFECTIVITY** column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
-------------	--

01295	Texas Instruments, Inc. US Semiconductor Group PO Box 5012 13500 N. Central Expressway Dallas, TX 75222
-------	---

02735	RCA Corp. Solid State Div. Route 202 Somerville, NJ 08876
-------	--

04713	Motorola, Inc. Semiconductor Products Group 5005 E. McDowell Rd. Phoenix, AZ 85008
-------	---

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
---------------------	--

07263	Fairchild Camera and Instrument Corp. Semiconductor Div. 464 Ellis St. Mountain View, CA 94042
-------	---

07910	Teledyne Semiconductor 1300 Terra Bella Ave. Mountain View, CA 94043
-------	--

14433	ITT Semiconductors PO Box 3049 3301 Electronics Way West Palm Beach, FL 33402
-------	--

16546	U.S. Capacitor Corp/Centralab Electronics Div 4561 Colorado Los Angeles, CA 90039
-------	--

18324	Signetics Corp. 811 E. Arques Ave. Sunnyvale, CA 94086
-------	--

18796	Erie Technological Products, Inc. State College Div. 1900 W. College Ave. State College, PA 16801
-------	--

20462	PREM Enterprises, Inc. 3519 N. Chapel Hill McHenry, IL 60050
-------	--

34335	Advanced Micro Devices 901 Thompson Pl. Sunnyvale, CA 94086
-------	---

56289	Sprague Electric Co. North Adams, MA 01247
-------	---

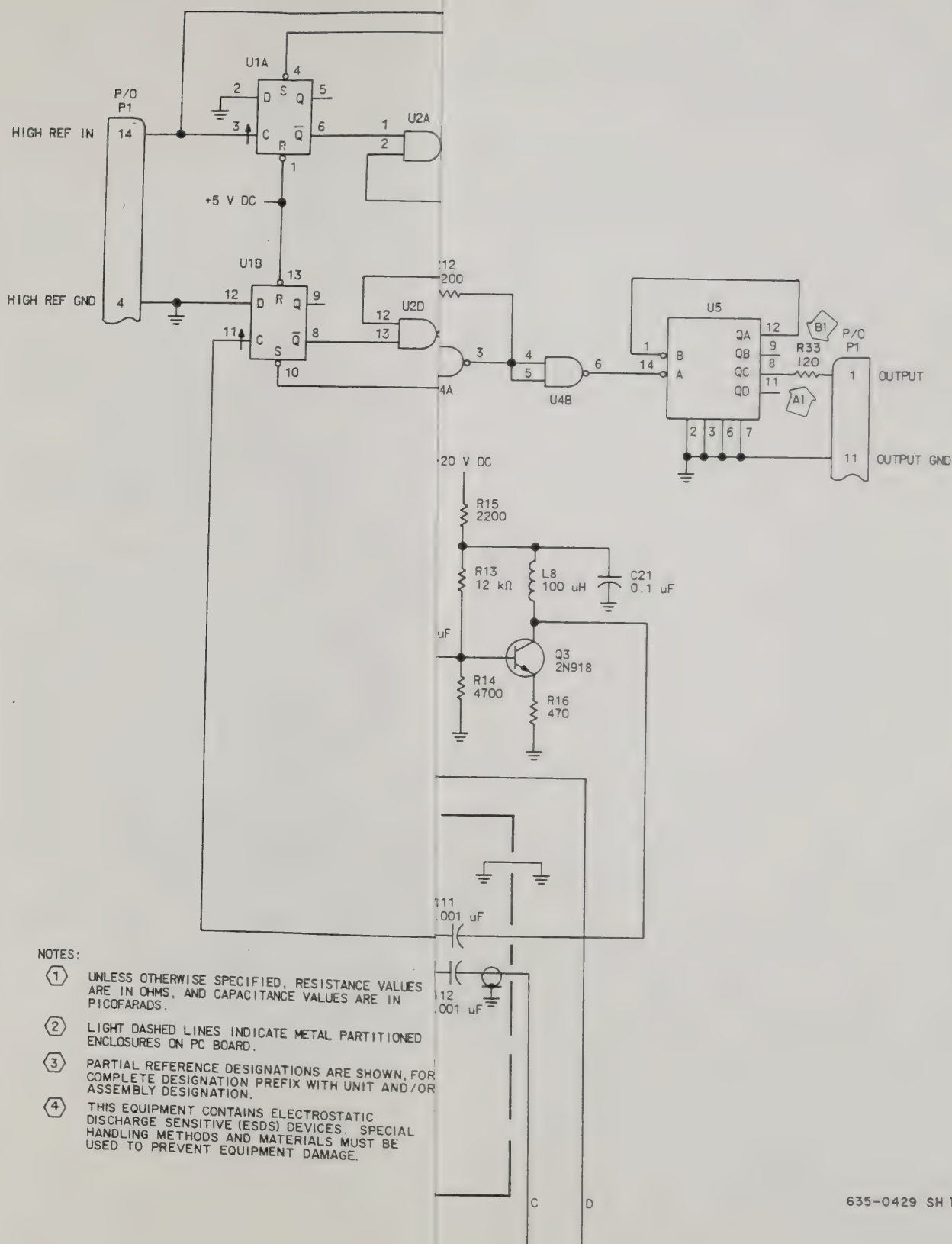
81349	Military Specifications
-------	-------------------------

96906	Military Standards
-------	--------------------

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
100-kHz synthesizer decade	623-2080-001	REV E
10-kHz synthesizer decade	623-2080-002	REV E
1-kHz synthesizer decade	623-2080-003	REV E
100/10-Hz synthesizer decade	623-2080-004	REV E
Decade circuit card	635-0650-001	REV P
Mixer if board	635-0651-001	REV A



Synthesizer Decode, Schematic Diagram
Figure 14 (Sheet 1 of 3)

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
01295	Texas Instruments, Inc. US Semiconductor Group PO Box 5012 13500 N. Central Expressway Dallas, TX 75222
02735	RCA Corp. Solid State Div. Route 202 Somerville, NJ 08876
04713	Motorola, Inc. Semiconductor Products Group 5005 E. McDowell Rd. Phoenix, AZ 85008

<u>MFR CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
07263	Fairchild Camera and Instrument Corp. Semiconductor Div. 464 Ellis St. Mountain View, CA 94042
07910	Teledyne Semiconductor 1300 Terra Bella Ave. Mountain View, CA 94043
14433	ITT Semiconductors PO Box 3049 3301 Electronics Way West Palm Beach, FL 33402
16546	U.S. Capacitor Corp/Centralab Electronics Div 4561 Colorado Los Angeles, CA 90039
18324	Signetics Corp. 811 E. Arques Ave. Sunnyvale, CA 94086
18796	Erie Technological Products, Inc. State College Div. 1900 W. College Ave. State College, PA 16801
20462	PREM Enterprises, Inc. 3519 N. Chapel Hill McHenry, IL 60050
34335	Advanced Micro Devices 901 Thompson Pl. Sunnyvale, CA 94086
56289	Sprague Electric Co. North Adams, MA 01247
81349	Military Specifications
96906	Military Standards

6.3 Equipment Covered

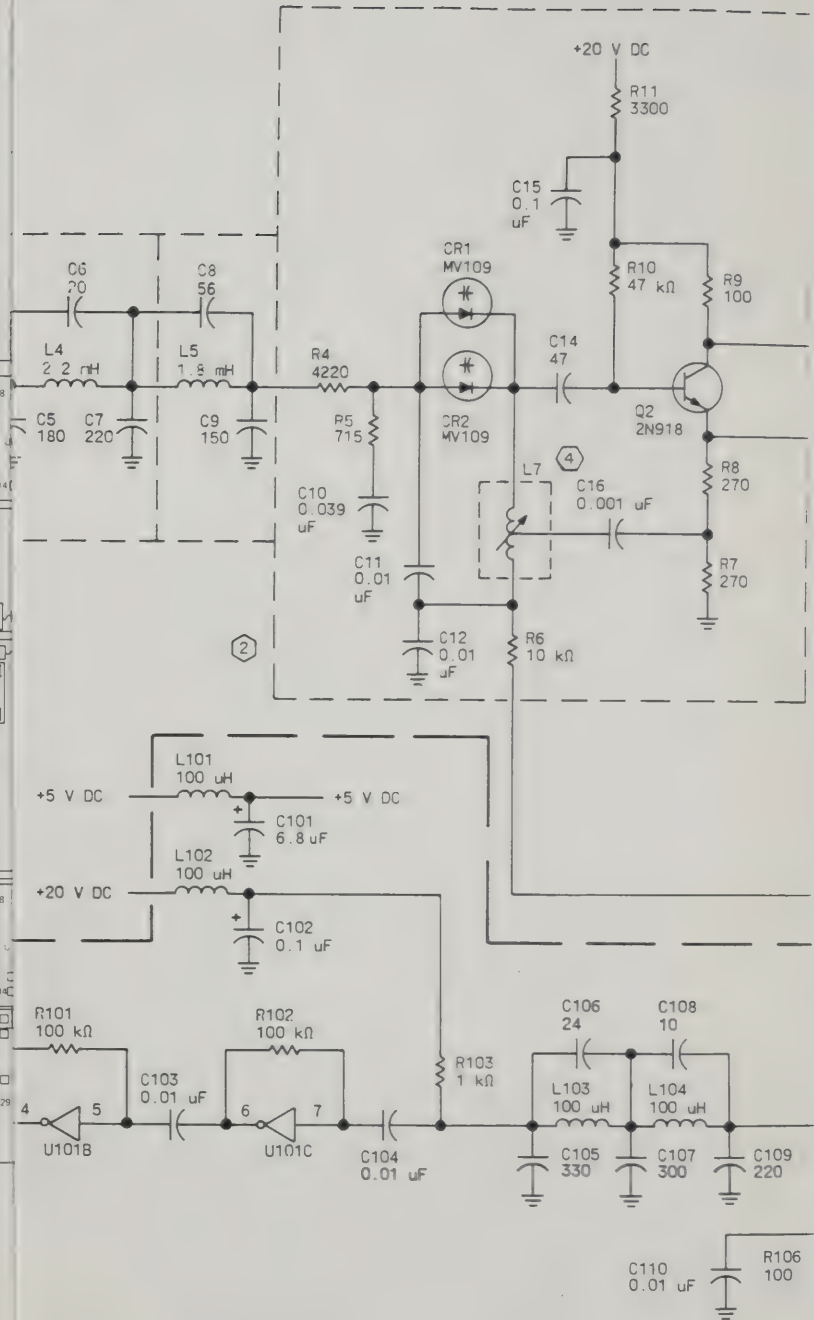
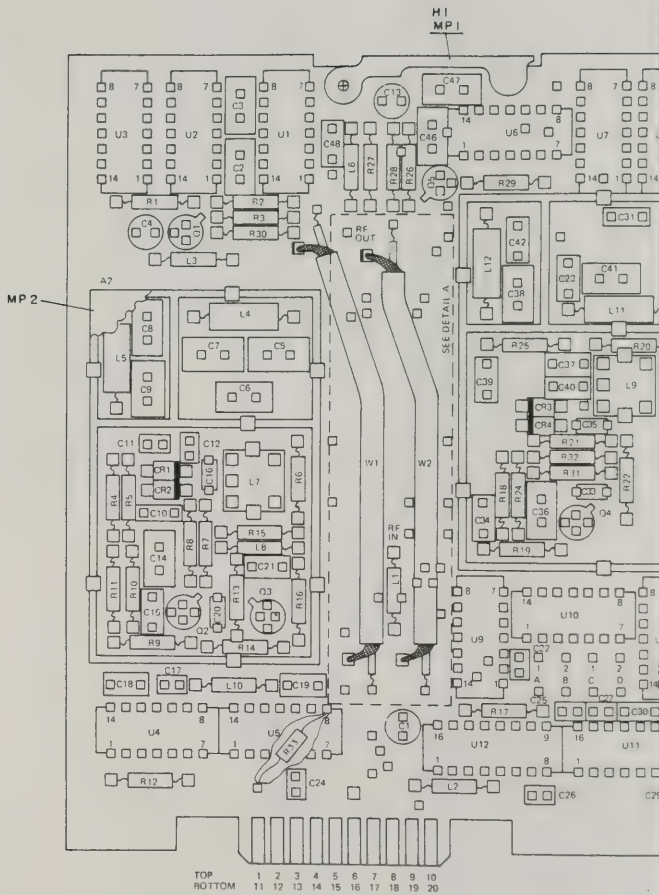
Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
100-kHz synthesizer decade	623-2080-001	REV E
10-kHz synthesizer decade	623-2080-002	REV E
1-kHz synthesizer decade	623-2080-003	REV E
100/10-Hz synthesizer decade	623-2080-004	REV E
Decade circuit card	635-0650-001	REV P
Mixer if board	635-0651-001	REV A

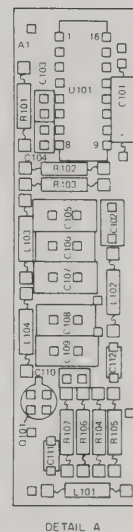
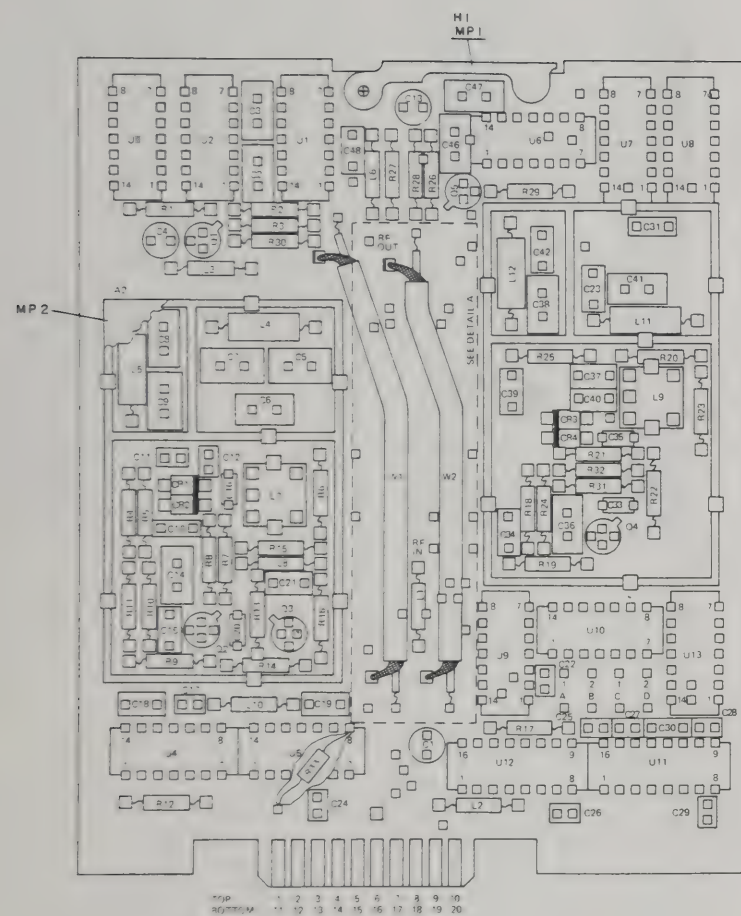


Revised 1 October 1980

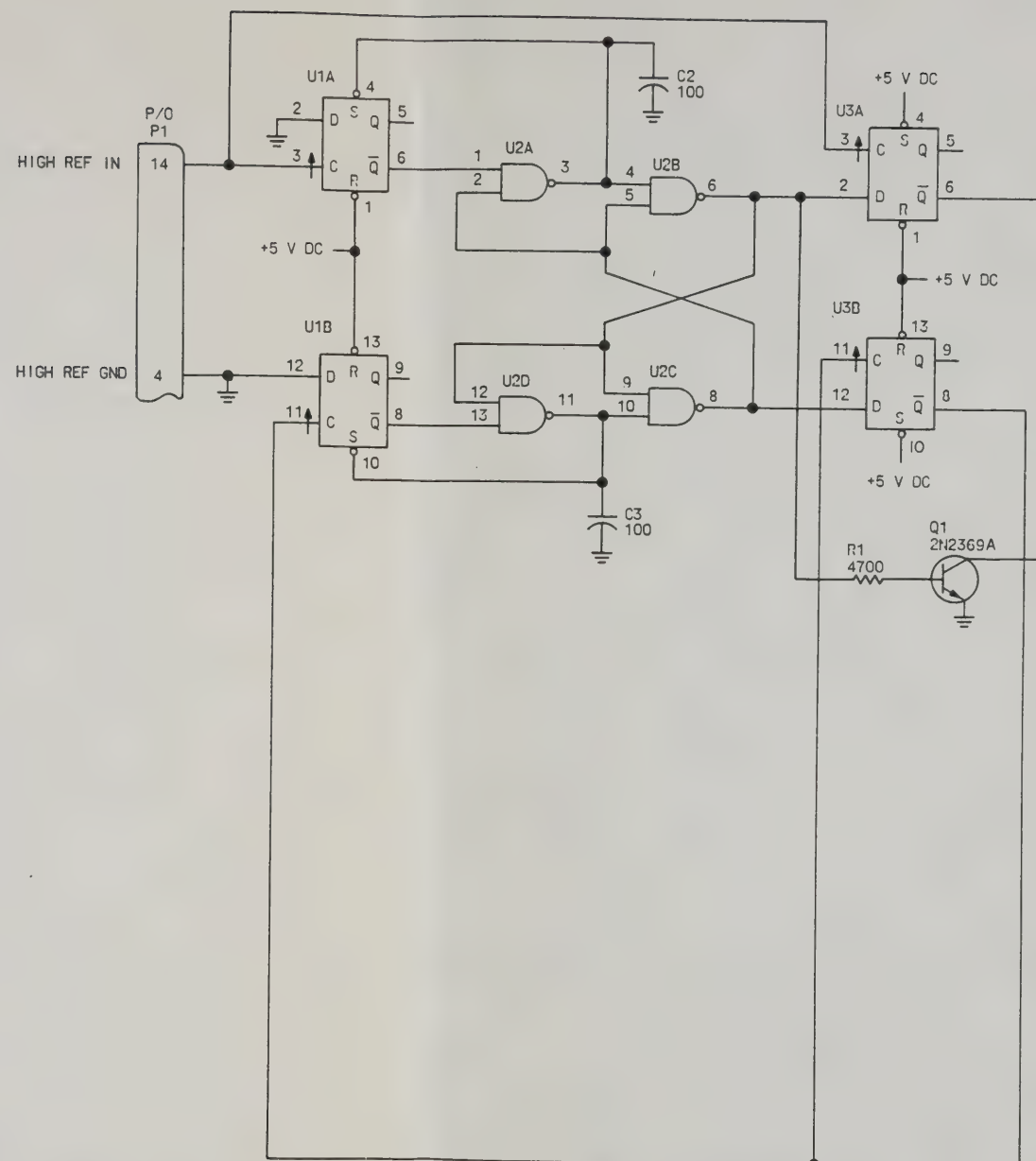
DE CIRCUIT CARD
(0650-001)



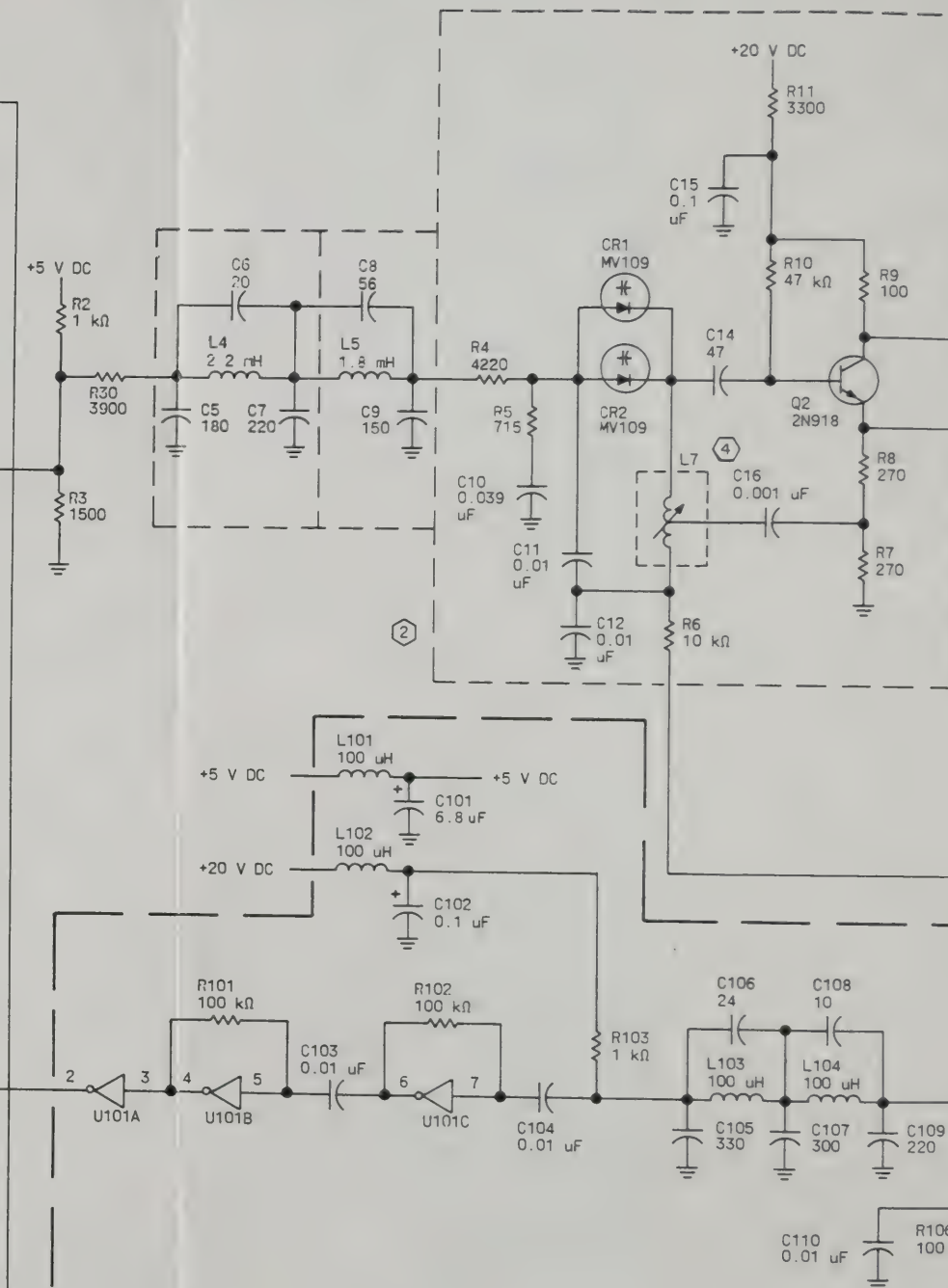
BOARD
(651-001)



TP5-1065-014



P/O A2 DECADE CIRCUIT CARD
(635-0650-001)



A1 MXR IF BOARD
(635-0651-001)

NOTES:

- ① UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, AND CAPACITANCE VALUES ARE IN PICO FARADS.
- ② LIGHT DASHED LINES INDICATE METAL PARTITIONED ENCLOSURES ON PC BOARD.
- ③ PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- ④ THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

POWER AND GROUND CONNECTIONS

U NO.	TYPE	PWR (V DC)	
		+5	GND
U1, U3, U6, U8, U13	SN74LS74N	14	7
U2, U4, U7, U9	N74LS00N	14	7
U5	SN74LS90N	5	10
U10	N74LS20N	14	7
U11, U12	SN74LS190N	16	8
U101	F40498PC	1	8

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	N
L8	COIL,RF 100UH	240-2047-000		96906	M
L9	NOT USED				
L10	COIL,RF 33UH	240-2041-000		96906	M
L11,L12	COIL,RF 22000UH	240-2715-650		96906	M
L13	COIL,RF 1.50UH (A1)(B1)	240-2025-000		96906	M
Q1	TRANSISTOR	352-0596-030		14433	2)
Q2-Q4	TRANSISTOR	352-0440-000		07910	2)
Q5	TRANSISTOR	352-0596-030		14433	2)
R1	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RC
R2	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RC
R3	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RC
R4	RESISTOR,FXD FILM, 4.22K, 1%, 1/8W	705-1026-000		81349	RM
R5	RESISTOR,FXD FILM, 715 OHMS, 1%, 1/8W	705-0989-000		81349	RM
R6	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RC
R7,R8	RESISTOR,FXD CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RC
R9	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RC
R10	RESISTOR,FXD CMPSN, 47K, 10%, 1/4W	745-0809-000		81349	RC
R11	RESISTOR,FXD CMPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RC
R12	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RC
R13	RESISTOR,FXD CMPSN, 12K, 10%, 1/4W	745-0788-000		81349	RC
R14	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RC
R15	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RC
R16	RESISTOR,FXD CMPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RC
R17	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RC
R18	RESISTOR,FXD CMPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RC
R19	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RC
R20	RESISTOR,FXD CMPSN, 1.2K, 10%, 1/4W	745-0752-000		81349	RC
R21	RESISTOR,FXD CMPSN, 270 OHMS, 10%, 1/4W (B1)	745-0728-000		81349	RC
R21	RESISTOR,FXD CMPSN, 180 OHMS, 10%, 1/4W	745-0722-000		81349	RC
R22	RESISTOR,FXD CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RC
R23	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RC
R24	RESISTOR,FXD CMPSN, 47K, 10%, 1/4W	745-0809-000		81349	RC
R25	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RC
R26	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RC
R27	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/4W	745-0770-000		81349	RC
R28	RESISTOR,FXD CMPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RC
R29	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RC
R30	RESISTOR,FXD CMPSN, 3.9K, 10%, 1/4W	745-0770-000		81349	RC
R31	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RC
R32	RESISTOR,FXD CMPSN, 56 OHMS, 10%, 1/4W	745-0704-000		81349	RC
R33	RESISTOR,FXD CMPSN, 120 OHMS, 10%, 1/4W (B1)	745-0716-000		81349	RC
U1	INTEGRATED CIRCUIT	351-1525-040		18324	N7
U2	INTEGRATED CIRCUIT	351-1523-110		18324	N7
U3	INTEGRATED CIRCUIT	351-1525-040		18324	N7
U4	INTEGRATED CIRCUIT	351-1523-110		18324	N7
U5	INTEGRATED CIRCUIT	351-1636-010		01295	SN
U6	INTEGRATED CIRCUIT	351-1525-040		18324	N7
U7	INTEGRATED CIRCUIT	351-1523-110		18324	N7
U8	INTEGRATED CIRCUIT	351-1525-040		18324	N7
U9	INTEGRATED CIRCUIT	351-1523-110		18324	N7
U10	INTEGRATED CIRCUIT	351-1523-130		18324	N7
U11,U12	INTEGRATED CIRCUIT (ESDS)	351-1527-040		34335	SN
U13	INTEGRATED CIRCUIT	351-1525-040		18324	N7

natic Diagram
t 2)

Revised 1 October 1980

PARTS LIST (Cont)

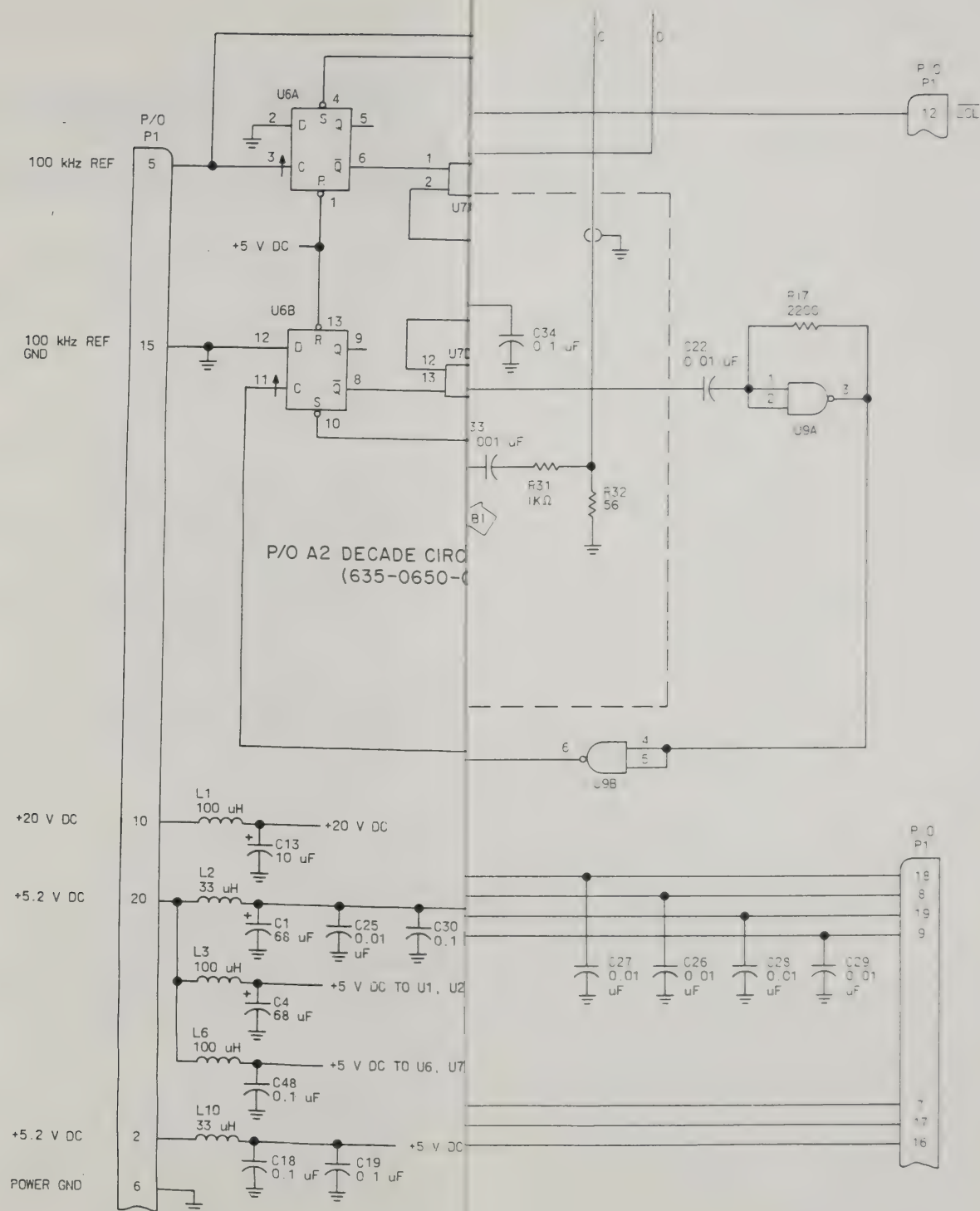
MODIFICATION HISTORY

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER	REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
L8	COIL,RF 100UH	240-2047-000		96906	MS75085-07	A1	Added A2L13, 1.5μH	635-0650-001
L9	NOT USED							REV K and
L10	COIL,RF 33UH	240-2041-000		96906	MS75085-01			above
L11,L12	COIL,RF 22000UH	240-2715-650		96906	MS75089-39			
L13	COIL,RF 1.50UH (A1)(B1)	240-2025-000		96906	MS75084-02			
Q1	TRANSISTOR	352-0596-030		14433	2N2369A	B1	Deleted A2L13, 1.5μH. Added A2R33, 120Ω in same place as A2L13	635-0650-001
Q2-Q4	TRANSISTOR	352-0440-000		07910	2N918		was removed. Changed A2R21 from 270 to 180Ω.	REV M and
Q5	TRANSISTOR	352-0596-030		14433	2N2369A			above.
R1	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS			
R2	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R3	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS			
R4	RESISTOR,FXD FILH, 4.22K, 1%, 1/8W	705-1026-000		81349	RN5504221F			
R5	RESISTOR,FXD FILH, 715 OHMS, 1%, 1/8W	705-0989-000		81349	RN5507150F			
R6	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS			
R7,R8	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS			
R9	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS			
R10	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G473KS			
R11	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G332KS			
R12	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS			
R13	RESISTOR,FXD CHPSN, 12K, 10%, 1/4W	745-0788-000		81349	RCR07G123KS			
R14	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS			
R15	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS			
R16	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR07G471KS			
R17	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS			
R18	RESISTOR,FXD CHPSN, 3.3K, 10%, 1/4W	745-0767-000		81349	RCR07G332KS			
R19	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS			
R20	RESISTOR,FXD CHPSN, 1.2K, 10%, 1/4W	745-0752-000		81349	RCR07G122KS			
R21	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W (B1)	745-0728-000		81349	RCR07G271KS			
R21	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/4W	745-0722-000		81349	RCR07G181KS			
R22	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS			
R23	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS			
R24	RESISTOR,FXD CHPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G473KS			
R25	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS			
R26	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R27	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/4W	745-0770-000		81349	RCR07G392KS			
R28	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS			
R29	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS			
R30	RESISTOR,FXD CHPSN, 3.9K, 10%, 1/4W	745-0770-000		81349	RCR07G392KS			
R31	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS			
R32	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0704-000		81349	RCR07G560KS			
R33	RESISTOR,FXD CHPSN, 120 OHMS, 10%, 1/4W (B1)	745-0716-000		81349	RCR07G121KS			
U1	INTEGRATED CIRCUIT	351-1525-040		18324	N74LS74N883C			
U2	INTEGRATED CIRCUIT	351-1523-110		18324	N74LS00N			
U3	INTEGRATED CIRCUIT	351-1525-040		18324	N74LS74N883C			
U4	INTEGRATED CIRCUIT	351-1523-110		18324	N74LS00N			
U5	INTEGRATED CIRCUIT	351-1636-010		01295	SN74LS90N			
U6	INTEGRATED CIRCUIT	351-1525-040		18324	N74LS74N883C			
U7	INTEGRATED CIRCUIT	351-1523-110		18324	N74LS00N			
U8	INTEGRATED CIRCUIT	351-1525-040		18324	N74LS74N883C			
U9	INTEGRATED CIRCUIT	351-1523-110		18324	N74LS00N			
U10	INTEGRATED CIRCUIT	351-1523-130		18324	N74LS20N			
U11,U12	INTEGRATED CIRCUIT (ESDS)	351-1527-040		34335	SN74LS190N			
U13	INTEGRATED CIRCUIT	351-1525-040		18324	N74LS74N883C			

Synthesizer Decade, Schematic Diagram
Figure 14 (Sheet 2)

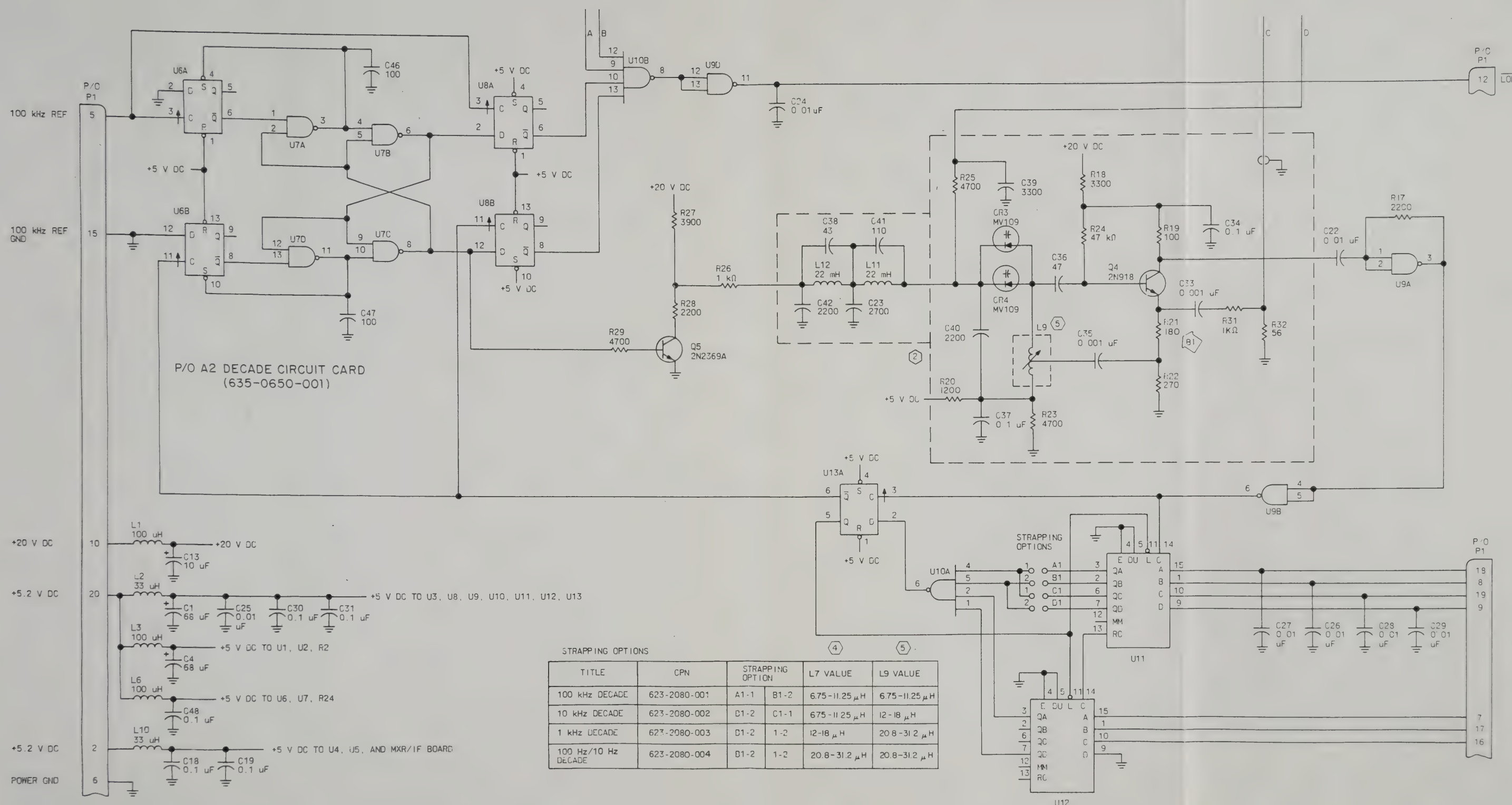
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR COD	EFFECTIVITY
	SYNTH 100-KHZ DECADE	623-2080-001	A		
	SYNTH 10-KHZ DECADE	623-2080-002	B		635-0650-001
	SYNTH 1-KHZ DECADE	623-2080-003	C		REV K and
	SYNTH 100/10-HZ DECADE	623-2080-004	D		above
A1	MIXER/IF BOARD (ESDS)	635-0651-001			
A2	DECADE BOARD (ESDS)	635-0650-001			
L1-L6	NOT USED				
L7	INDUCTOR, RF	242-0441-030	A, B	2046	635-0650-001
L7	INDUCTOR, RF	242-0441-040	C	2046	REV M and
L7	INDUCTOR, RF	242-0441-050	D	2046	above.
L8	NOT USED				
L9	INDUCTOR, RF	242-0441-030	A	2046	
L9	INDUCTOR, RF	242-0441-040	B	2046	
L9	INDUCTOR, RF	242-0441-050	C, D	2046	
	MIXER/IF BOARD A1 (ESDS)	635-0651-001			
C1-C100	NOT USED				
C101	CAPACITOR, FXD ELCTLT, 6.8UF, 10%, 6V	184-9086-020		8134	
C102	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	
C103,	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654	
C104					
C105	CAPACITOR, FXD MICA DIEL, 330PF, 5%, 100V	912-3915-000		8134	
C106	CAPACITOR, FXD MICA DIEL, 24PF, 5%, 500V	912-3843-000		8134	
C107	CAPACITOR, FXD MICA DIEL, 300 PF, 5%, 300V	912-3912-000		8134	
C108	CAPACITOR, FXD MICA DIEL, 10PF, PORM 0.5PF, 500V	912-3837-000		8134	
C109	CAPACITOR, FXD MICA DIEL, 220PF, 5%, 500V	912-3903-000		8134	
C110	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654	
C111,	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134	
C112					
L1-L100	NOT USED				
L101-	COIL, RF 100UH	240-2047-000		9690	
L104					
Q1-Q100	NOT USED				
Q101	TRANSISTOR (ESDS)	352-1093-010		0273	
R1-R100	NOT USED				
R101,	RESISTOR, FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		8134	
R102					
R103	RESISTOR, FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		8134	
R104	RESISTOR, FXD CHPSN, 180 OHMS, 10%, 1/4W	745-0722-000		8134	
R105	RESISTOR, FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		8134	
R106	RESISTOR, FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		8134	
R107	RESISTOR, FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		8134	
U1-U100	NOT USED				
U101	INTEGRATED CIRCUIT (ESDS)	351-8159-210		0726	
	DECADE BOARD A2 (ESDS)	635-0650-001			
CR1-CR4	SEMICONV DEVICE GL DIEL, 0.8 TO 8.5PF, 1000V	922-6124-040		0471	
C1	CAPACITOR, FXD ELCTLT, 68UF, 20%, 6V	184-9102-040		5628	
C2, C3	CAPACITOR, FXD MICA DIEL, 100PF, 5%, 500V	912-3879-000		8134	
C4	CAPACITOR, FXD ELCTLT, 68UF, 20%, 6V	184-9102-040		5628	
C5	CAPACITOR, FXD MICA DIEL, 180PF, 5%, 500V	912-3897-000		8134	
C6	CAPACITOR, FXD MICA DIEL, 20PF, 5%, 500V	912-3841-000		8134	
C7	CAPACITOR, FXD MICA DIEL, 220PF, 5%, 500V	912-3903-000		8134	
C8	CAPACITOR, FXD MICA DIEL, 56PF, 5%, 500V	912-3861-000		8134	
C9	CAPACITOR, FXD MICA DIEL, 150PF, 5%, 500V	912-3891-000		8134	
C10	CAPACITOR, FXD CER DIEL, 0.039UF, PORM10%, 100V	913-5019-390		8134	
C11, C12	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654	
C13	CAPACITOR, FXD ELCTLT, 10UF, 20%, 25V	184-9102-240		5628	
C14	CAPACITOR, FXD MICA DIEL, 47PF, 5%, 500V	912-3856-000		8134	
C15	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	
C16	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134	
C17	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654	
C18, C19	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	
C20	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134	
C21	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	
C22	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654	
C23	CAPACITOR, FXD CER DIEL, 0.0027UF, 5%, 100V	913-3117-130		8134	
C24-C29	CAPACITOR, FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		1654	
C30, C31	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	
C32	NOT USED				
C33	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134	
C34	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	
C35	CAPACITOR, FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134	
C36	CAPACITOR, FXD MICA DIEL, 47PF, 5%, 500V	912-3856-000		8134	
C37	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	
C38	CAPACITOR, FXD MICA DIEL, 43PF, 5%, 500V	912-3854-000		8134	
C39	CAPACITOR, FXD CER DIEL, 3300PF, PORM10%, 100V	913-3281-170		1879	
C40	CAPACITOR, FXD CER DIEL, 2200PF, PORM10%, 100V	913-3281-160		1879	
C41	CAPACITOR, FXD MICA DIEL, 110PF, 5%, 500V	912-3882-000		8134	
C42	CAPACITOR, FXD CER DIEL, 2200PF, PORM10%, 100V	913-3281-160		1879	
C43-C45	NOT USED				
C46, C47	CAPACITOR, FXD MICA DIEL, 100PF, 5%, 500V	912-3879-000		8134	
C48	CAPACITOR, FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		1654	
L1	COIL, RF 100UH	240-2047-000		9690	
L2	COIL, RF 33UH	240-2041-000		9690	
L3	COIL, RF 100UH	240-2047-000		9690	
L4	COIL, RF 2200UH	240-2715-530		9690	
L5	COIL, RF 1800UH	240-2715-520		9690	
L6	COIL, RF 100UH	240-2047-000		9690	
L7	NOT USED				



635-0429 SH 2

Synthesizer Decade, Schematic Diagram
Figure 14 (Sheet 3)



635-0429 SH 2

Synthesizer Decade, Schematic Diagram
Figure 14 (Sheet 3)

Revised 1 October 1980

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International

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Collins Telecommunications Products Division

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Synthesizer Output
(635-4930-001, -002)

Synthesizer Output (635-4930-001, -002)

Printed in USA

1. DESCRIPTION

Synthesizer Output 635-4930-001, -002, shown in figure 1, is a module that contains a base 2-layer planar card, four rf secure compartments (metal box construction), and five printed wiring boards. The base 2-layer planar card contains a 20-pin edge-on connector (2 layers, 10 pins each).

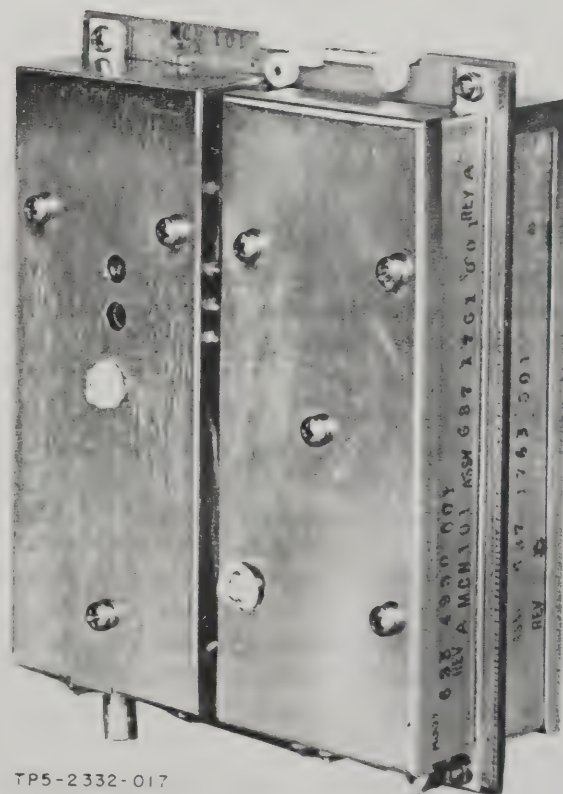
The synthesizer output module consists of translator logic, translator vco, output mixer, output logic, output vco, low-pass filter circuits, and a loss-of-lock (lol) monitor circuit.

2. PRINCIPLES OF OPERATION

2.1 General (Refer to figure 2.)

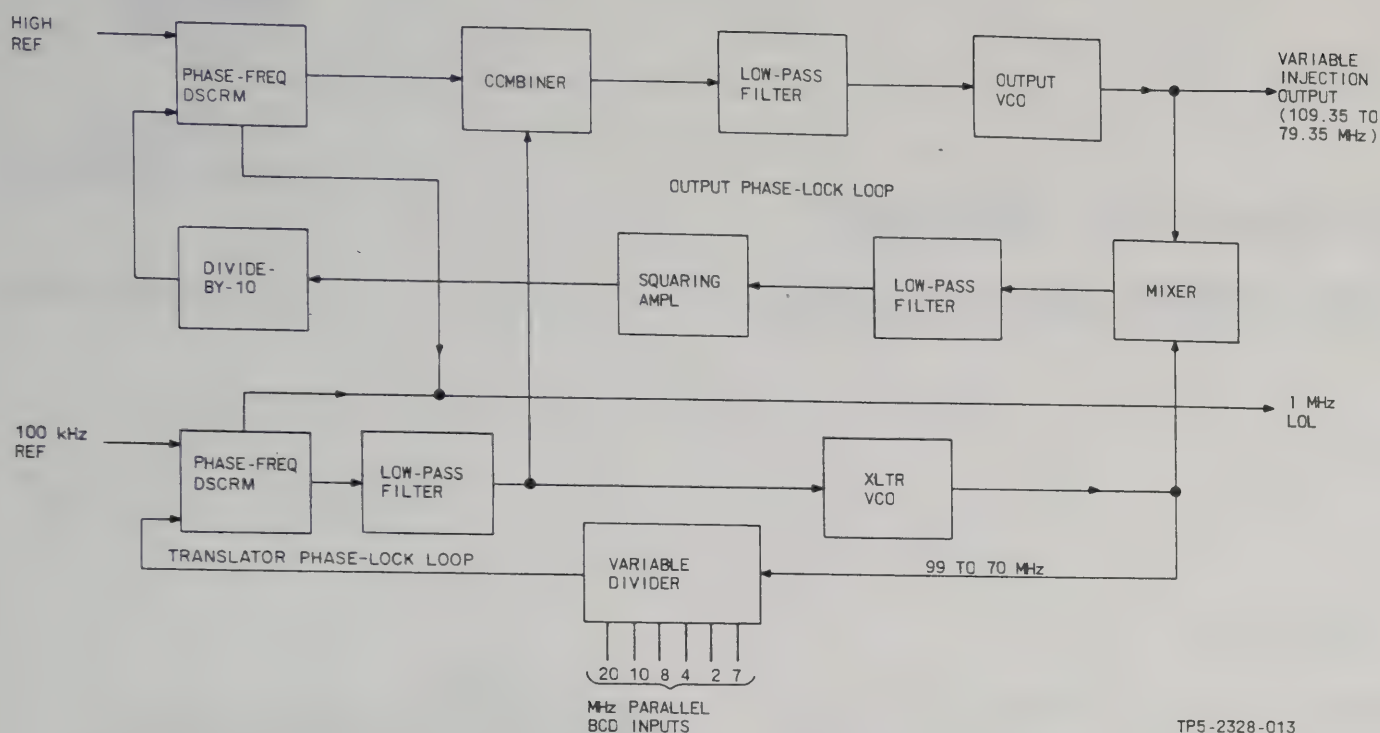
The synthesizer output module receives MHz bcd frequency control signals, a 100-kHz reference signal and a high-reference signal (1.035 to 0.935001 MHz), and generates a 109.35- to 79.35001-MHz variable injection signal output and a 1-MHz lock signal output (logic 1 for lock).

The translator logic circuits receive a 100-kHz reference input, a translator vco signal, and a bcd frequency input. The bcd frequency input is used to program a variable frequency divider (divide-by-99 to 70). The programmed variable frequency divider output (100 kHz) and the 100-kHz reference input are supplied to a phase/frequency discriminator that, with a low-pass filter, provides a control voltage proportional to the phase/frequency difference between its inputs. This control voltage is also supplied as a tracking voltage to the output phase-lock loop.



Synthesizer Output
Figure 1

The translator vco circuit receives the control voltage signal from translator logic circuits and is driven to and phase-locked at the variable frequency as programmed by variable divider bcd inputs to translator logic circuits. The translator vco output (99 to 70 MHz) is supplied to translator logic circuits for



TP5-2328-013

Synthesizer Output, Block Diagram
Figure 2

clocking and lock signal generation. The translator vco output (99 to 70 MHz) is supplied to output mixer circuits for frequency mixing.

The output mixer circuit receives the translator signal input (99 to 70 MHz) and the output vco signal input (109.35 to 79.3501 MHz), mixes them and supplies a reference signal input (10.35 to 9.35001 MHz) through the low-pass filter and divide-by-10 counter to the phase/frequency discriminator. In the phase/frequency discriminator, the divide-by-10 output (1.035 to 0.935 MHz) is compared with the high reference input and produces an output control voltage.

The output control voltage is mixed with the tracking voltage input from the translator logic and vco circuits and applied to the output vco circuit. The output vco circuit receives the output control voltage signal from the output logic circuits and is driven to and locked at the variable injection frequency (109.35 to 79.3501 MHz).

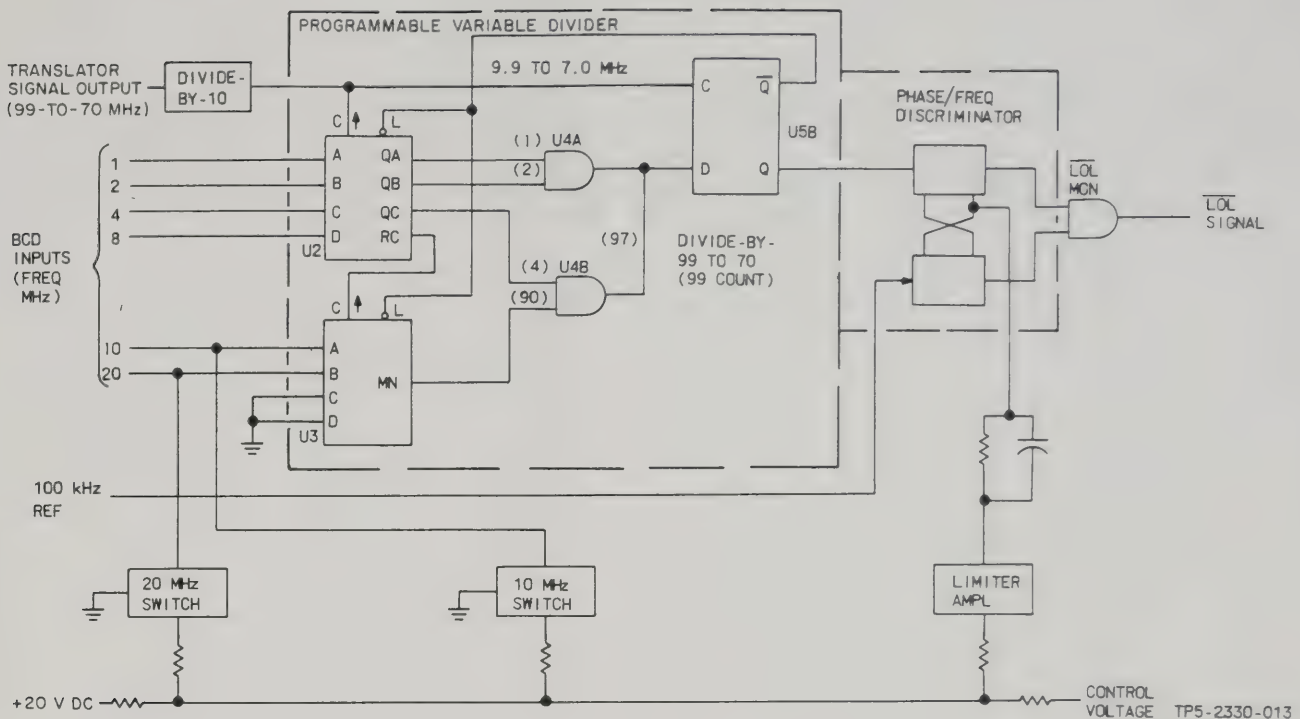
The output vco circuit is phase-locked to the high reference input and through the translator phase-lock loop to the 100-kHz reference input.

The output vco output (109.35 to 79.3501 MHz) is supplied as the variable injection to associated rf circuits.

2.2 Translator Logic Circuits

The translator logic circuits receive a 100-kHz reference input, a translator vco signal output, and bcd frequency inputs for 0, 1, 2, 4, 8, 10, and 20 MHz; it also supplies a control voltage output signal to the translator vco.

Refer to figure 3. The translator vco signal output (99 to 70 MHz) is supplied through a fixed divide-by-10 network (9.9 to 7.0 MHz) and applied as the clock input to a programmable variable divider. The output of the programmable variable divider (100 kHz) is supplied to a phase/frequency discriminator and is compared with a 100-kHz reference input. A phase or frequency difference in the discriminator causes a control voltage input increase or decrease to adjust the frequency of the vco. If there is no phase or frequency difference, the discriminator provides a logic 1 lock signal output indicating the vco frequency is locked. Note that a 10- or 20-MHz bcd input enables switches that change the limiter amplifier voltage divider ratio to equalize the loop gain over the frequency range.



Translator Logic Circuits
Figure 3

The programmable variable divider is programmed by bcd frequency inputs. For example, if a bcd input of 00 MHz is applied, the up/down decade counter is programmed to load the count 0 at any time a load signal (logic 0) is applied. Refer to table 1. This programs the variable divider to count from 0 (first count 1) to 99 (last count 99/0), causing the output of the variable divider to be 1/99th of the clock input, or divide-by-99 with a bcd input of 00. Note that as the bcd input goes up 1, 2, 3 etc, the division ratio goes down 98, 97, 96, etc. Also note that for the divide-by circuit to operate as a constant, the last count 99 must also be the loaded count (in the case of bcd 00, count 0). To do this, prerecognition of count 99 is required. Look-ahead circuit of U4A and U4B performs this function. At clock 97 (count 97) gates U4A and U4B are ANDed and supply a logic 1 input to U5B-D. With a logic 1 at U5B-D, clock 98 (count 98) causes U5B-Q to go to logic 0 and loads decade counter to bcd input (ANDed outputs of U4A and U4B are removed). At clock 98, U5B-Q supplies a pulse to phase/frequency discriminator. Clock 99 (count 00) causes U5B-Q to go to logic 1 and enables decade counter to count on the next clock. Next clock is one above the bcd programmed input. Note that count 98 initiates the output from the divider and count 99 appears only as the bcd programmed input. Refer to figure 4. A 15-MHz programmed input is shown; the same principles apply to any other programmed bcd input.

2.3 Translator VCO Circuits

The translator vco circuits receive a control voltage from the translator logic circuits. The control voltage drives the vco to the required translator frequency. The translator signal output is supplied through one buffer amplifier to the output mixer circuits and through a second buffer amplifier to the translator logic circuits.

2.4 Output Mixer Circuits

The output mixer circuits receive a translator signal input (99 to 70 MHz) from the translator vco. The translator vco signal is mixed with the output vco frequency (109.35 to 79.35001 MHz) and a resulting difference frequency (10.35 to 9.35001 MHz) is supplied through a low-pass filter to the output logic circuits.

2.5 Output Logic Circuits

The output logic circuits receive the output mixer difference frequency (10.35 to 9.35001 MHz), a tracking voltage from the translator vco, and a high reference input signal (1.035 to 0.935001 MHz), and supply a control voltage output signal to operate the output vco.

Table 1. Variable Divider, Logic Truth Table.

FREQUENCY CONTROL (MHz)	PROGRAMMABLE INPUTS								OUTPUT COUNT	DIVIDE- BY	LOOP FREQUENCY (MHz)
	U2				U3						
	A	B	C	D	A	B	*C	*D			
0	0	0	0	0	0	0	0	0	0	99	99
1	1	0	0	0	0	0	0	0	1	98	98
2	0	1	0	0	0	0	0	0	2	97	97
3	1	1	0	0	0	0	0	0	3	96	96
4	0	0	1	0	0	0	0	0	4	95	95
5	1	0	1	0	0	0	0	0	5	94	94
6	0	1	1	0	0	0	0	0	6	93	93
7	1	1	1	0	0	0	0	0	7	92	92
8	0	0	0	1	0	0	0	0	8	91	91
9	1	0	0	1	0	0	0	0	9	90	90
10	0	0	0	0	1	0	0	0	10	89	89
11	1	0	0	0	1	0	0	0	11	88	88
12	0	1	0	0	1	0	0	0	12	87	87
13	1	1	0	0	1	0	0	0	13	86	86
14	0	0	1	0	1	0	0	0	14	85	85
15	1	0	1	0	1	0	0	0	15	84	84
16	0	1	1	0	1	0	0	0	16	83	83
17	1	1	1	0	1	0	0	0	17	82	82
18	0	0	0	1	1	0	0	0	18	81	81
19	1	0	0	1	1	0	0	0	19	80	80
20	0	0	0	0	0	1	0	0	20	79	79
21	1	0	0	0	0	1	0	0	21	78	78
22	0	1	0	0	0	1	0	0	22	77	77
23	1	1	0	0	0	1	0	0	23	76	76
24	0	0	1	0	0	1	0	0	24	75	75
25	1	0	1	0	0	1	0	0	25	74	74
26	0	0	1	0	0	1	0	0	26	73	73
27	1	1	1	0	0	1	0	0	27	72	72
28	0	0	0	1	0	1	0	0	28	71	71
29	1	0	0	1	0	1	0	0	29	70	70

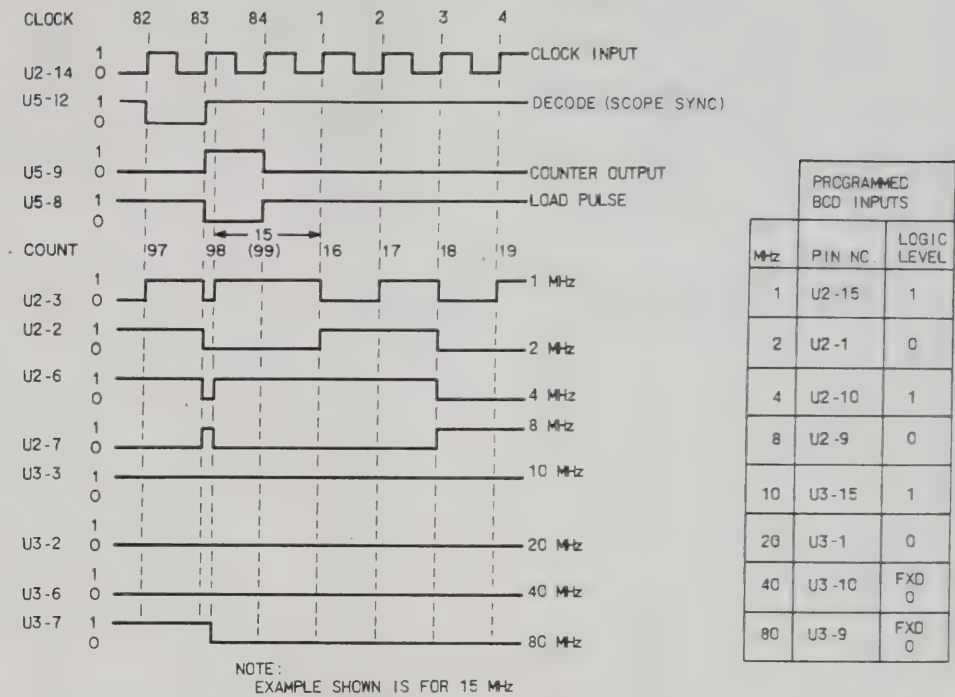
*Grounded inputs (fixed logic 0)

Refer to figure 5. The output mixer difference frequency (10.35 to 9.35001 MHz) is supplied through a squaring amplifier and a fixed divide-by-10 network (1.035 to 0.935001 MHz), to a phase/frequency discriminator. This frequency from the divide-by-10 network is compared with the high reference input signal (1.035 to 0.935001 MHz). A phase or frequency difference in the discriminator causes the control voltage to increase or decrease to adjust the frequency of the vco. If there is no phase or frequency difference, the discriminator provides a logic 1 lock signal output and the vco frequency locks. Note that the translator tracking voltage is summed with the

output logic circuits' control voltage to provide control voltage for the total variable injection frequency output (109.35 to 79.35001 MHz).

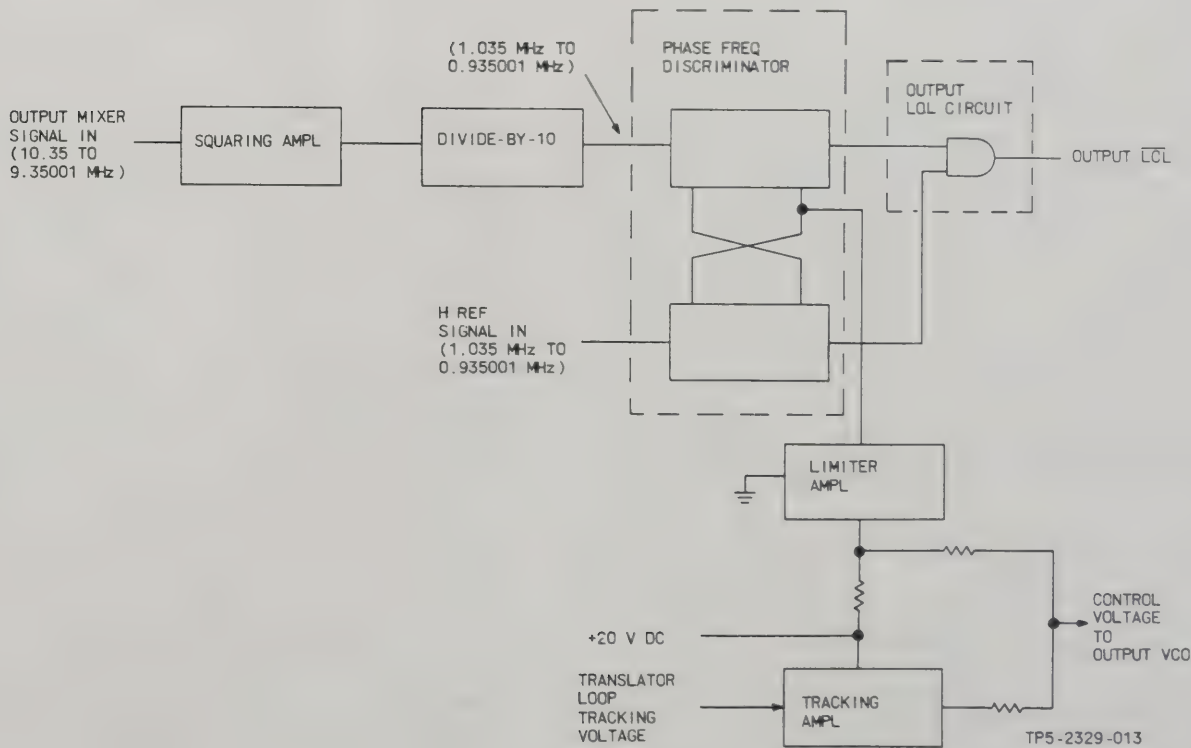
2.6 Output VCO Circuits

The output vco circuits receive a control voltage from the output logic circuits. The control voltage drives the vco to the required output variable injection frequency. The output variable injection frequency is supplied through one output amplifier to the unit under control and through a second output amplifier to the output mixer circuits.



TP5-2331-013

Variable Divider, Inputs and Outputs
Figure 4



TP5-2329-013

Output Logic Circuits
Figure 5

2.7 Up/Down Decade Counter 351-1527-040 (Refer to table 2 and figure 6.)

The 351-1527-040 up/down decade counter is a 4-bit decade counter. Synchronous operation is provided by having all flip-flops clocked simultaneously so that the outputs change coincident with each other when input conditions are met.

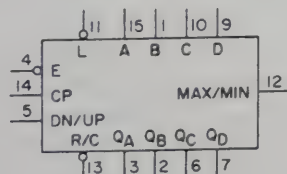
A high at the enable input inhibits counting. A low at the enable input and a low-to-high clock transition triggers the four master/slave flip-flops. The enable input should be changed only when the clock is high. The down/up input determines the direction of the count. When low, the count goes up; when high, the count goes down.

These counters are programmable. The outputs may be preset to any state by placing a low on the load input and entering the desired data at the data inputs. The output changes to agree with the data inputs independently of the state of the clock input. This allows the counters to be used as modulo N dividers by modifying the count length with the preset inputs.

Two outputs are available to perform the cascading function: ripple clock and maximum/minimum count. The latter output produces a high level output pulse with a duration approximately equal to one complete cycle of the clock when the counter overflows or underflows. The ripple clock output produces a low level output pulse equal in width to the low level portion of the clock input when an overflow or underflow condition exists. The counters are cascaded by feeding the ripple clock output to the enable input of the succeeding counter if parallel clocking is used, or to the clock input if parallel enabling is used. The maximum/minimum count output can be used to accomplish look-ahead for high-speed operation.

2.8 Decade Counter 351-1636-010 (Refer to table 3 and figure 7.)

The 351-1636-010 decade counter is a high-speed, monolithic decade counter consisting of four dual-



V_{CC} = PIN 16

GND = PIN 8

TP5-2325-013

Up/Down Decade Counter 351-1527-040
Figure 6

Table 2. Up/Down Decade Counter 351-1527-040,
Logic Truth Table.

PROGRAMMABLE INPUTS				COUNT	BCD OUTPUTS			
A	B	C	D		QA	QB	QC	QD
0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	0	0	0
0	1	0	0	2	0	1	0	0
1	1	0	0	3	1	1	0	0
0	0	1	0	4	0	0	1	0
1	0	1	0	5	1	0	1	0
0	1	1	0	6	0	1	1	0
1	1	1	0	7	1	1	1	0
0	0	0	1	8	0	0	0	1
1	0	0	1	9	1	0	0	1

E (enable): logic 0 enables counter; logic 1 inhibits counter.

L (load): logic 0 programs the bcd output count to be set at the bcd count of the programmable inputs; the next clock pulse counts one higher/lower (up/down).

DU (down/up): logic 0 counts up; logic 1 counts down.

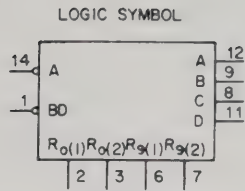
CP (clock pulse): logic 0-to-logic 1 transition advances counter.

RC (ripple clock): logic 0 pulse equal to 1/2 clock cycle when an overflow occurs.

MM (maximum/minimum count): logic 1 pulse equal to full clock cycle when an overflow or underflow occurs.

rank, master-slave flip-flops internally interconnected to provide a divide-by-2 counter and a divide-by-5 counter. Gated direct reset lines are provided to inhibit count inputs and return all outputs to a logic 0 or to a binary coded decimal (bcd) count of 9. As the output from flip-flop A is not internally connected to the succeeding stages, the count may be separated into the three following independent count modes:

- When used as a binary coded decimal decade counter, the BD input must be externally connected to the A output. The A input receives the incoming count, and a count sequence is obtained in accordance with the bcd count sequence truth table shown above. In addition to a conventional 0 reset, inputs are provided to reset a bcd 9-count for 9's complement decimal applications.
- If a symmetrical divide-by-10 count is desired for frequency synthesizers or other applications requiring division of a binary count by a power of 10, the D output must be externally connected to the A input. The input count is then applied at the BD input and a divide-by-10 square wave is obtained at output A.



TP5-2326-012

Decade Counter 351-1636-010

Figure 7

- c. For operation as a divide-by-2 counter and divide-by-5 counter, no external interconnections are required. Flip-flop A is used as a binary element for the divide-by-2 function. The BD input is used to obtain binary divide-by-5 operation at the B, C, and D outputs. In this mode, the two counters operate independently; however, all four flip-flops are reset simultaneously.

2.9 Dual D-Type Flip-Flop With Preset and Clear 351-1525-040 (Refer to table 4 and figure 8.)

The 351-1525-040 consists of dual high-speed, D-type flip-flops. Information on the D input is transferred to the Q output on the positive going edge of the clock pulse. Clock triggering occurs at a voltage level of the clock pulse and is not directly related to the transition time of the positive going pulse. When the clock input is at either high or low level, the D input signal has no effect.

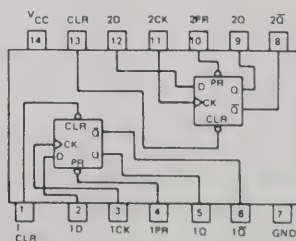
3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the synthesizer output module are listed in the maintenance section of this instruction book.

3.2 Testing

The test procedures in table 5 check total performance of the synthesizer output module. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.



TP5-2327-011

Dual D-Type Flip-Flop With Preset and Clear 351-1525-040

Figure 8

Table 3. Decade Counter 351-1636-010, Logic Truth Table.

*BCD COUNT SEQUENCE				
COUNT	OUTPUT			
	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

**RESET/COUNT					
RESET INPUTS				OUTPUT	
R ₀₍₁₎	R ₀₍₂₎	R ₉₍₁₎	R ₉₍₂₎	D	C B A
1	1	0	X	0	0 0 0
1	1	X	0	0	0 0 0
X	X	1	1	1	0 0 1
X	0	X	0	Count	
0	X	0	X	Count	
0	X	X	0	Count	
X	0	0	X	Count	

*Output A connected to input BD for BCD count.
 **X indicates that either a logical 1 or a logical 0 may be present.

Table 4. Dual D-Type Flip-Flop With Preset And Clear 351-1525-040, Logic Truth Table.

INPUTS				OUTPUTS	
PRESET	CLEAR	CLOCK	D	Q	$\bar{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	*H	*H
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q ₀	$\bar{Q}_0$

H = high level (steady state)
 L = low level (steady state)
 X = irrelevant
 ↑ = transition from low to high level
 Q₀ = the level of Q before the indicated input conditions were established.

* This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (high) level.

Table 5. Synthesizer Output, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of the unit containing the synthesizer output that is to be tested. b. Remove cover from the synthesizer section of the unit. c. Remove synthesizer output and install it on an extender card and place it in the unit. d. Set unit LINE SELECTOR switch to 115 V. e. Connect unit to 115-V ac power source and set power on. f. Measure dc voltage from J1-19 to J1-17 (ground). g. Measure dc voltage from J1-7 to J1-17 (ground). h. Measure dc voltage from J1-20 to J1-17 (ground). i. Set unit MODE switch to ISB.	+5.2 $\pm$ 0.2 V dc. NLT +19.5 V dc. NMT +20.8 V dc. +8.0 $\pm$ 0.5 V dc.	Check unit synthesizer voltage regulator. Check unit synthesizer voltage regulator. Check unit power supply.
2. Synthesizer output	a. Set FREQUENCY KHZ control on front panel to 29555.55 (or 29555.5). b. Using a frequency counter (or oscilloscope), measure the high reference input between P1-1 and P1-2 (ground). c. Measure the dc voltage at A3E110. (Refer to note and chart at end of test 2 for voltages and frequencies at different 10 and 1 MHz settings.) d. Using a frequency counter, measure the output at P2. e. Measure the dc voltage at A1E100. f. Note the dc voltage at A1E100 while moving the 10 and 1 MHz frequency controls from 9 down to 0.	979 $\pm$ 1 kHz. Note actual frequency 4.90 $\pm$ 0.1 V dc. 79.79 $\pm$ 0.005 MHz. (Actual should equal 79.35 MHz plus the difference between 1035 kHz and the actual frequency in step a.) 4.80 $\pm$ 0.1 V dc. Refer to chart at end of test 2. (Voltage goes up as frequency controls go down.)	Check unit decades one at a time. Adjust L2 for 4.90 $\pm$ 0.1 V dc. If L2 adjustment does not correct the problem check Q4, Q5, and associated circuit. Adjust L3 for actual frequency with required V dc at A1E100. If L3 adjustment does not correct the problem check A1A1Q1, A1A1Q2, A1A103, and associated circuits. Same as step d. Adjust L3 so that all settings fall into the limits shown in chart.
(Cont)			

Table 5. Synthesizer Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	g. Set FREQUENCY KHZ control on front panel to 00000.00 (or 00000.0). h. Using a frequency counter, measure the high reference input between P1-1 and P1-2 (ground). i. Using a frequency counter, measure the output at P2. j. Set FREQUENCY KHZ control on front panel to 29999.99 (or 29999.9). k. Using a frequency counter, measure the output at P2. l. Measure the dc voltage at P1-8 to ground. m. Ground P1-10 while noting the voltage at P1-8. n. Remove P1-10 ground. o. Set front-panel PWR switch off. p. Remove 100-kHz decade from unit under test. q. Set front-panel PWR switch on. r. Measure the dc voltage at P1-8 to ground. s. Set front-panel PWR switch off. t. Replace 100-kHz decade in unit under test.	1035 $\pm$0.5 kHz. 109.350 MHz $\pm$0.5 kHz. 79.350 MHz $\pm$0.5 kHz. NLT +3.5 V dc. Note RCV FAULT, EXCTR FAULT, or R/E FAULT indicator lighting indicates that results of step m are satisfactory. NMT 0.5 V dc. NMT 0.5 V dc.	Check unit 100-kHz decade. Check A4A1U1 thru A4A1U5 and associated circuits. Same as step i. Check A4A1U4 and A4A1U6 thru A4A1U8. Same as step l. Check A2A1U3 thru A2A1U5.
(Cont)			

Table 5. Synthesizer Output, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE		NORMAL INDICATION	IF INDICATION IS ABNORMAL	
2. (Cont)					
Note The following chart is shown with an input frequency of 1035 ±5 kHz. The actual output frequency with an input frequency can be determined using the following formula: AF = LF - 100 kHz + 1035 kHz - IF. AF = actual output frequency at P2. LF = output frequency listed in chart for associated MHz frequency digits. IF = actual input frequency.					
10-MHz FREQ DIGIT	1-MHz FREQ DIGIT	A3E110 DC VOLTAGE	XLTR FREQ A3A1E9 (MHz)	A1E100 DC VOLTAGE	OUTPUT FREQ P2 (MHz)
2	9	4.90	70.000	4.80	80.350
	8	5.20	71.000	5.05	81.350
	7	5.50	72.000	5.30	82.350
	6	5.80	73.000	5.60	83.350
	5	6.10	74.000	5.85	84.350
	4	6.40	75.000	6.15	85.350
	3	6.70	76.000	6.40	86.350
	2	7.05	77.000	6.70	87.350
	1	7.35	78.000	7.00	88.350
	0	7.70	79.000	7.25	89.350
1	9	8.00	80.000	7.55	90.350
	8	8.35	81.000	7.85	91.350
	7	8.70	82.000	8.15	92.350
	6	9.00	83.000	8.45	93.350
	5	9.35	84.000	8.80	94.350
	4	9.70	85.000	9.10	95.350
	3	10.10	86.000	9.40	96.350
	2	10.45	87.000	9.75	97.350
	1	10.85	88.000	10.05	98.350
	0	11.20	89.000	10.40	99.350
0	9	11.60	90.000	10.75	100.350
	8	12.00	91.000	11.10	101.350
	7	12.40	92.000	11.50	102.350
	6	12.85	93.000	11.90	103.350
	5	13.30	94.000	12.30	104.350
	4	13.75	95.000	12.75	105.350
	3	14.20	96.000	13.25	106.350
	2	14.70	97.000	13.75	107.350
	1	15.25	98.000	14.30	108.350
	0	15.80	99.000	14.90	109.350
Note Table shown with an input frequency of 1035 ±5 kHz (front-panel FREQUENCY KHZ setting of XX000.00 (or XX000.0)). Frequencies shown ±0.0005 MHz, voltages shown ±0.1 V dc.					

4. ALIGNMENT/ADJUSTMENT

Note

Perform these adjustments only if repairs have been made and test procedures in table 5 cannot meet the normal indications.

4.1 Translator VCO Tracking

Note

Translator VCO must be in an open-loop condition. To perform this adjustment disconnect wire from A3A1E5 and check that continuity is broken between A3A1E5 and A4A1E8. When adjustment is complete, reconnect A3A1E3.

- Perform setup of table 5, test 1.
- Adjust the slug in oscillator coil A3A1L2 to approximately 1.6 mm (1/16 in) below coil form.
- Adjust the plates in oscillator capacitor A3A1C7 two turns below the top of capacitor form.
- Set front-panel FREQUENCY KHZ to 29000.00 (or 29000.0).
- Connect a frequency counter between P1-1 and P1-2 (ground). Must equal 1035 ± 0.5 kHz.
- Connect a frequency counter between P1-10 and P1-9 (ground). Must equal 100 ± 0.01 kHz.
- Connect a frequency counter at A3A1E5 to A3A1E4 (ground).
- Adjust the slug in oscillator coil A3A1L2 for 70.000 MHz ± 20 kHz.
- Set front-panel FREQUENCY KHZ to 00000.00 (or 00000.0).
- Adjust the plates in oscillator capacitor A3A1C7 for 99.000 MHz ± 20 kHz.

Note

Adjust capacitor A3A1C7 for an error opposite the error of coil A3A1L2. Example, if A3A1L2 is adjusted at 70.000 MHz minus 20 kHz, adjust A3A1C7 for 99.000 MHz plus 20 kHz.

- Repeat steps f through j until low and high frequencies are within 10 kHz of the correct frequency.

4.2 Output VCO Tracking

- Perform setup of table 5, test 1.
- Adjust the slug in oscillator coil A1A1L3 to approximately 1.6 mm (1/16 in) below coil form.

- Adjust the plates in oscillator capacitor A1A1C2 two turns below the top of capacitor form.
- Set front-panel FREQUENCY KHZ to 29000.00 (or 29000.0).
- Connect a frequency counter between P1-1 and P1-2 (ground). Must equal 1035 ± 0.5 kHz.
- Connect a frequency counter between P1-10 and P1-9 (ground). Must equal 100 ± 0.01 kHz.
- Connect a frequency counter with 50- Ω load at P2.
- Adjust the slug in oscillator coil A1A1L3 for 80.350 MHz ± 20 kHz.
- Set front-panel FREQUENCY KHZ to 00000.00 (or 00000.0).
- Adjust the plates in oscillator capacitor A1A1C2 for 109.350 MHz ± 20 kHz.

Note

Adjust capacitor A1A1C2 for an error opposite the error of coil A1A1L3. Example, if A1A1L3 is adjusted at 80.350 MHz minus 20 kHz, adjust A1A1C2 for 109.350 MHz plus 20 kHz.

- Repeat steps f through j until low and high frequencies are within 10 kHz of the correct frequency.

4.3 Output VCO Level Adjustment

- Perform setup of table 5, test 1.
- Connect an rf voltmeter with 50- Ω load to P2.
- Set front-panel FREQUENCY KHZ to 16000.00 (or 16000.0).
- Adjust A1A1R4 for +7 dB mW on rf voltmeter.

Note

A1A1R10 may be replaced with a selected resistor (50 through 720 Ω) to meet this adjustment.

4.4 Output VCO Final Tuning

- Perform setup of table 5, test 1.
- Connect a high-impedance scope probe to A2A1U4-6.

Note

A steady rectangular waveform should be seen. The object of this adjustment is to make the rectangular waveform as near a square wave as possible throughout the synthesizer output tuning range.

- c. Set front-panel FREQUENCY KHZ controls to 29 555.55 kHz.
- d. Adjust A1A1L3 for a 42-percent duty ratio (square wave, 42-percent logic 1, 58-percent logic 0).
- e. Set front-panel FREQUENCY KHZ controls to 00 555.55 kHz.
- f. Adjust A1A1C2 for duty ratio, opposite that indicated. For example, if a 30-percent duty ratio is indicated, adjust for a 70-percent duty ratio.
- g. Repeat steps c through f until the duty ratio at both end frequencies is between 45 and 55 percent.

5. REPAIR

Repair of the synthesizer output module is accomplished using standard planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 9). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number

and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

CODE	MANUFACTURER'S NAME AND ADDRESS
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75222
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876

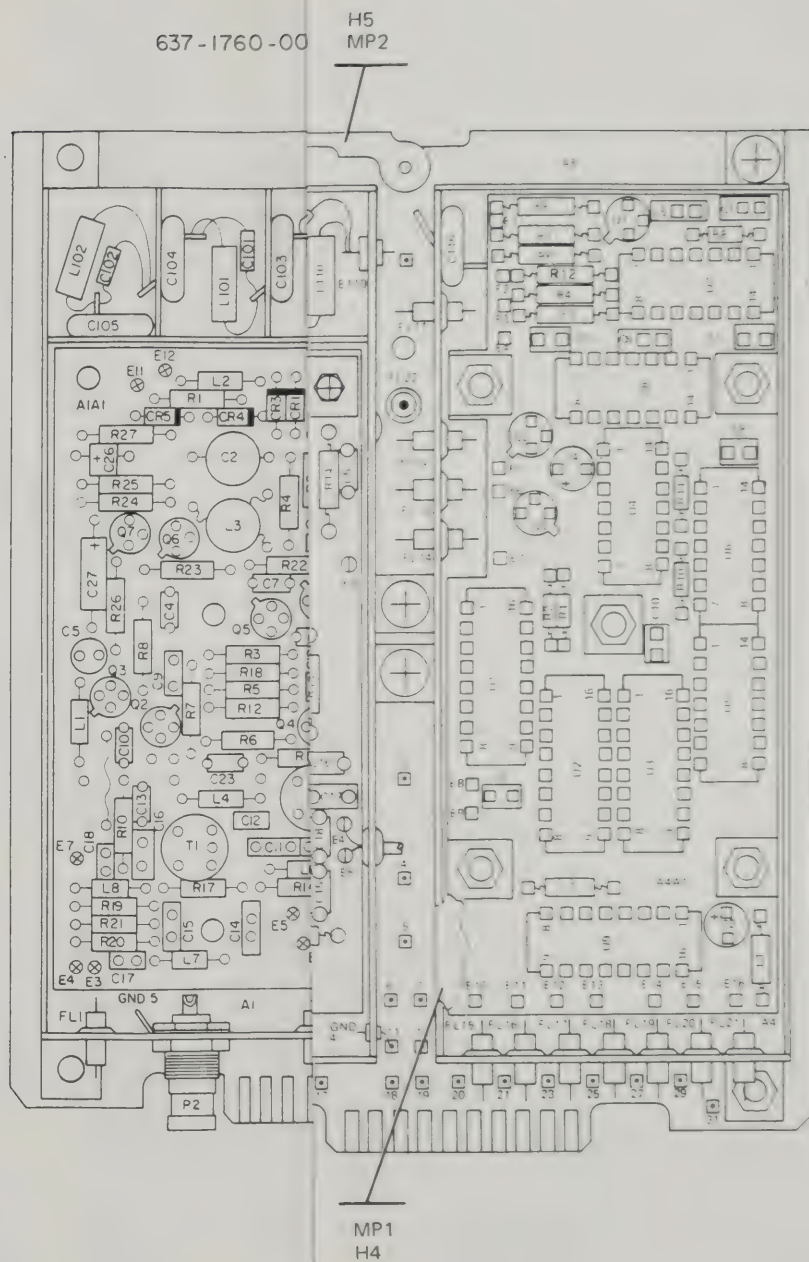
CODE	MANUFACTURER'S NAME AND ADDRESS
03550	VANGUARD ELECTRONICS CO INC 930 W HYDE PARK BLVD INGLEWOOD CA 90302
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
07910	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
10646	CARBORUNDUM CO THE P O BOX 337 NIAGARA FALLS NY 14302
14433	ITT SEMICONDUCTOR DIV WEST PALM BEACH FL
15818	TELEDYNE SEMICONDUCTOR 1300 TERRA BELLA AVE MOUNTAIN VIEW CA 94043
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054
18324	SIGNETICS CORP 811 E ARQUES SUNNYVALE CA 94086
22229	SOLITRON DEVICES INC SEMICONDUCTOR GROUP SAN DIEGO OPERS 8808 BALBOA AVE SAN DIEGO CA 92123
25088	SIEMENS CORP 186 WOOD AVE S ISELIN NJ 08830
28480	HEWLETT-PACKARD CO CORPORATE HQ 1501 PAGE MILL RD PALO ALTO CA 94304
34335	ADVANCED MICRO DEVICES 901 THOMPSON PL SUNNYVALE CA 94086
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501

CODE	MANUFACTURER'S NAME AND ADDRESS
72982	ERIE TECHNOLOGICAL PRODUCTS INC 644 W 12TH ST ERIE PA 16512
77250	PHEOLL MFG CO DIV OF ALLIED PRODUCTS CORP 5700 W ROOSEVELT RD CHICAGO IL 60650
80294	BOURNS INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
91293	JOHANSON MFG CO P O BOX 329 BOONTON NJ 07005
96906	MILITARY STANDARD
98291	SEAELECTRO CORP 225 HOYT MAMARONECK NY 10544

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Synthesizer output	635-4930-001	REV G
Output vco assy A1	637-1760-001	REV J
Output vco board		
A1A1	635-0890-002	REV J
Output mixer-logic assy		
A2	637-1761-001	REV H
Output logic board		
A2A1	635-0836-001	REV E
Output mixer board		
A2A2	635-0837-001	REV D
Translator vco assy A3	637-1763-001	REV G
Translator vco board		
A3A1	635-0846-001	REV F
Translator logic assy		
A4	637-1762-001	REV F
Translator logic board		
A4A1	635-0646-001	REV E
Synthesizer output	635-4930-002	REV G
Output vco assy A1	637-1760-002	REV J
Output vco board		
A1A1	638-6520-001	REV B



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Synthesizer Output, Schematic Diagram
Figure 9 (Sheet 1 of 6)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	AS MFR CODE	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	SYNTH OUTPUT	635-4930-001 A		57-001			
	SYNTH OUTPUT	635-4930-002 B		19-000		81349	RCR07G151KS
				22-000		81349	RCR07G181KS
A1	OUTPUT VCO (ESDS)	637-1760-001 A		25-000		81349	RCR07G221KS
A1	OUTPUT VCO (ESDS)	637-1760-002 B		31-000		81349	RCR07G331KS
A2	OUTPUT MIXER/LOGIC (ESDS)	637-1761-001		33-000		81349	RCR07G391JS
A3	TRANSLATOR VCO (ESDS)	637-1763-001		37-000		81349	RCR07G471KS
A4	TRANSLATOR LOGIC (ESDS)	637-1762-001		40-000		81349	RCR07G561KS
A5	CONNECTOR BOARD	635-0998-001		25-000		81349	RCR07G221KS
FL1-FL21	NOT USED			64-000		81349	RCR07G272KS
FL22	FILTER,RAD INTR 1750PF	241-5006-010		81349	55-000	81349	RCR07G152KS
H1	MUT,PLAIN,HEX NP BRS, 4-40 (QTY 6)	313-0051-000		77250	52-000	81349	RCR07G122KS
H2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 16)	310-0095-000		96906	58-000	81349	RCR07G182KS
H3	SCREW,HACH NP BRS, 4-40 X 5/16 (QTY 6)	343-0286-000		77250	07-000	81349	RCR07G680KS
H4	SCREW,HACH NP BRS, 4-40 X 1/4 (QTY 10)	343-0285-000		77250	16-000	81349	RCR07G121KS
H5	PIN,SPR SST, 0.078 DIA X 1/4 (QTY 1)	311-0355-000		96906	64-000	81349	RCR07G272KS
MP1	COVER, BOX (QTY 2)	635-4802-001			40-000	81349	RCR07G561KS
MP2	HANDLE (QTY 1)	637-2559-001			13-000	81349	RCR07G101KS
					04-000	81349	RCR07G560KS
	OUTPUT VCO A1 (ESDS)	637-1760-001 A					
	OUTPUT VCO A1 (ESDS)	637-1760-002 B			31-000	81349	RCR07G331KS
					46-000	81349	RCR07G821KS
A1	OUTPUT VCO BOARD (ESDS)	635-0890-002 A			28-000	81349	RCR07G271KS
A1	OUTPUT VCO BOARD (ESDS)	638-6520-001 B			86-000	81349	RCR07G180KS
C1-C99	NOT USED				21-000	81349	RCR07G104KS
C100	CAPACITOR,FXD CER DIEL, 18PF, 10%, 75V	913-1098-030		72982	48-000	81349	RCR07G564KS
					69-000	81349	RCR07G225KS
C101	CAPACITOR,FXD CER DIEL, 0.00015UF, 5%, 100V	913-3117-050		56289	61-000	81349	RCR07G222KS
C102	CAPACITOR,FXD MICA DIEL, 68PF, 5%, 50V	912-4141-330		72136	48-000	81349	RCR07G564KS
C103,	CAPACITOR,FXD MICA DIEL, 1500PF, 5%, 500V	912-4114-370		81349	34-000	81349	RCR07G391KS
C104					30-290	03550	22511
C105	CAPACITOR,FXD MICA DIEL, 750PF, 5%, 500V (A8)	912-4114-350		81349	16-100		
C105	CAPACITOR,FXD MICA DIEL, 1500PF, 5%, 500V	912-4114-370		81349	30-290	03550	22511
FL1,FL2	FILTER,RAD INTR 1750PF	241-5006-010		81349			
FL23	FILTER,RAD INTR 1750PF	241-5006-010 B		81349	61-001		
L1-L99	NOT USED						
L100-	COIL,RF 15000UH	240-2715-630		96906	36-001		
L102					37-001		
P1	NOT USED						
P2	CONNECTOR,RCPT ELEC	357-7207-090		98291	14-350	81349	CB11RE751J
R1-R14	NOT USED				11-050	72982	2404-014-15PF10
R15,R16	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/8W (A7)	745-2320-000 A		81349			
R17	RESISTOR,FXD CHPSN, 18 OHMS, 10%, 1/8W (A7)	745-2277-000 A		81349	06-010	81349	FL38GW1ED3-0001
	OUTPUT VCO BOARD A1A1 (ESDS)	635-0890-002 A			15-250	96906	MS75088-13
					15-260	96906	MS75088-14
CR1	SEMICOND DEVICE	922-6131-010		25088	15-250	96906	MS75088-13
CR2	SEMICOND DEVICE (ESDS)	353-3691-010		28480	15-290	96906	MS75089-3
CR3-CR5	SEMICOND DEVICE (A6)	922-6131-010		25088	47-000	96906	MS75085-07
C1	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (A6)	913-4018-000		81349			
C2	CAPACITOR,VAR AIR DIEL, 1 TO 10PF, 200V	922-0583-230		91293	36-001		
C3	CAPACITOR,FXD CER DIEL, 18PF, 10%, 75V	913-1098-030		72982			
					79-200	16546	CY30C104M
C4	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	79-110	16546	CY20C103M
C5	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	79-200	16546	CY30C104M
C6	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (A6)	913-4018-000		81349	98-020	72982	8111A075C0G0-470
C6	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349		K	
C7	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	02-680	56289	1990106X0025CE3
C8	CAPACITOR,FXD CER DIEL, 15PF, 5%, 75V (A6)	913-1098-180		72982	79-110	16546	CY20C103M
					79-200	16546	CY30C104M
C9	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (A6)	913-4018-000		81349	02-040	56289	1990686X00060B1
C9	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		72136	81-280	81349	CCR19CG101J
C10	CAPACITOR,FXD CER DIEL, 0.00047UF, 5%, 100V	913-3117-080		56289	02-330	56289	1990474X0035AB1
C11	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	41-400	72136	DMSF151J050WV
C12,C13	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	47-000	96906	MS75085-07
C14	CAPACITOR,FXD CER DIEL, 47PF, PORM 0.25PF, 150V	913-1098-370		72982	31-000	96906	MS75084-08
					47-000	96906	MS75085-07
C15	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V	912-4141-220		72136	17-010	01295	2N930
C16	CAPACITOR,FXD MICA DIEL, 51PF, 5%, 50V	912-4141-300		72136	96-030	14433	2N2369A
C17	CAPACITOR,FXD CER DIEL, 0.00068UF, 5%, 100V	913-3117-090		56289	29-000	81349	RCR05G471KS
C18	CAPACITOR,FXD CER DIEL, 270PF, 5%, 100V	913-1098-470		72982	55-000	81349	RCR07G152KS
					47-000	81349	RCR05G152KS
C19	CAPACITOR,FXD CER DIEL, 3PF, 0.25PF, 150V	913-1098-340		72982	29-000	81349	RCR05G471KS
C20	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	49-000	81349	RCR07G102KS
C21	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	41-000	81349	RCR05G102KS
C22	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	41-000	81349	RCR05G102KS
C23	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349			
C24	CAPACITOR,FXD MICA DIEL, 8PF, PORM 0.5PF, 300V (A6)	912-4141-110		72136	65-000	81349	RCR05G472KS
L1	COIL,RF 100UH				69-000	81349	RN5503322F
L2	COIL,RF 2.70UH (A6)	240-2047-000		96906	05-630	81349	RN5502102F
L2	COIL,RF 15UH	240-2037-000		96906	22-000	81349	RN5503481F
L3	COIL,ADJUSTABLE	637-4502-001		96906	24-000	81349	RN5503831F
L4	COIL,RF 100UH				63-120	81349	RN50C1002F
L5	COIL,RF 1UH (A4)	240-2047-000		96906	77-000	81349	RCR05G103KS
L6	COIL,RF 100UH	240-2023-000		96906	28-000	81349	RN5504641F
L7,L8	COIL,RF 0.100UH	240-2047-000		96906	80-000	81349	RN5504640F
Q1	TRANSISTOR (ESDS)	240-2723-140		96906	23-090	18324	N74LS04N
Q2	TRANSISTOR	352-0756-050		17856	36-010	01295	SN74LS90M
Q3,Q4	TRANSISTOR	352-0440-000		07910	25-040	04713	SN74LS74AM
Q5	TRANSISTOR (ESDS)	352-0792-020		02735	23-110	18324	N74LS00N
		352-0756-050		17856	25-040	04713	SN74LS74AM

atic Diagram
2)

Revised 1 January 1981

PARTS LIST

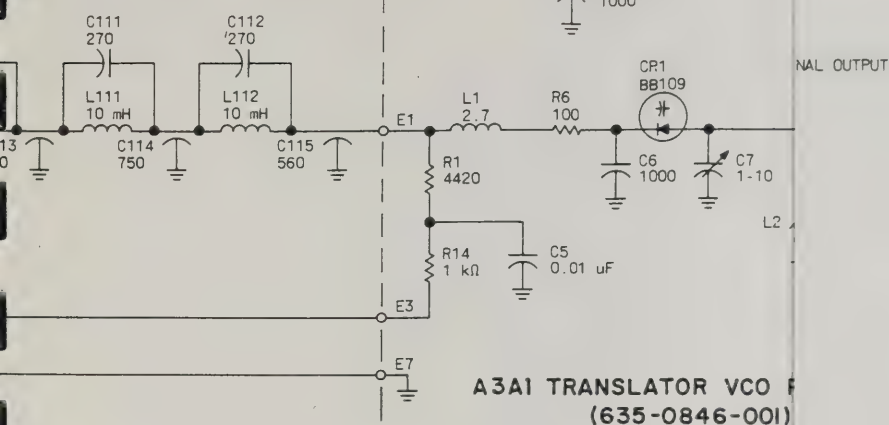
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	SYNTH OUTPUT	635-4930-001 A			
	SYNTH OUTPUT	635-4930-002 B			
A1	OUTPUT VCO (ESDS)	637-1760-001 A			
A1	OUTPUT VCO (ESDS)	637-1760-002 B			
A2	OUTPUT MIXER/LOGIC (ESDS)	637-1761-001			
A3	TRANSLATOR VCO (ESDS)	637-1763-001			
A4	TRANSLATOR LOGIC (ESDS)	637-1762-001			
A5	CONNECTOR BOARD	635-0998-001			
FL1-FL21	NOT USED				
FL22	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
H1	MUT,PLAIN,HEX NP BRS, 4-40 (QTY 6)	313-0051-000		77250	P313-0051-000
H2	WASHER,SPRING CD PL BRZ, 0.115 ID X 0.209 OD (QTY 16)	310-0095-000		96906	MS35338-97
H3	SCREW,MACH NP BRS, 4-40 X 5/16 (QTY 6)	343-0286-000		77250	P343-0286-000
H4	SCREW,MACH NP BRS, 4-40 X 1/4 (QTY 10)	343-0285-000		77250	P343-0285-000
H5	PN,SPR SST, 0.078 DIA X 1/4 (QTY 1)	311-0355-000		96906	MS16562-199
MP1	COVER, BOX (QTY 2)	635-4802-001			
MP2	HANDLE (QTY 1)	637-2559-001			
	OUTPUT VCO A1 (ESDS)	637-1760-001 A			
	OUTPUT VCO A1 (ESDS)	637-1760-002 B			
A1	OUTPUT VCO BOARD (ESDS)	635-0890-002 A			
A1	OUTPUT VCO BOARD (ESDS)	635-6520-001 B			
C1-C99	NOT USED				
C100	CAPACITOR,FXD CER DIEL, 18PF, 10%, 75V	913-1098-030		72982	8101A075C0G0-180 K
C101	CAPACITOR,FXD CER DIEL, 0.00015UF, 5%, 100V	913-3117-050		56289	1CC0G151X5100C4
C102	CAPACITOR,FXD MICA DIEL, 68PF, 5%, 50V	912-4141-330		72136	DMSE680J050MV
C103,	CAPACITOR,FXD MICA DIEL, 1500PF, 5%, 500V	912-4114-370		81349	CB11RE152J
C104					
C105	CAPACITOR,FXD MICA DIEL, 750PF, 5%, 500V (A6)	912-4114-350		81349	CB11RE751J
C105	CAPACITOR,FXD MICA DIEL, 1500PF, 5%, 500V	912-4114-370		81349	CB11RE152J
FL1,FL2	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
FL23	FILTER,RAD INTR 1750PF	241-5006-010 B		81349	FL38GW1ED3-0001
L1-L99	NOT USED				
L100-	COIL,RF 15000UH	240-2715-630		96906	MS75089-37
L102					
P1	NOT USED				
P2	CONNECTOR,RCPT ELEC	357-7207-090		98291	52-044-0000
R1-R14	NOT USED				
R15,R16	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/8W (A7)	745-2320-000 A		81349	RCR05G271KS
R17	RESISTOR,FXD CHPSN, 18 OHMS, 10%, 1/8W (A7)	745-2277-000 A		81349	RCR05G180KS
	OUTPUT VCO BOARD A1A1 (ESDS)	635-0890-002 A			
CR1	SEMICONO DEVICE	922-6131-010		25088	BB109-6131-010
CR2	SEMICONO DEVICE (ESDS)	353-3691-010		28480	1N5711
CR3-CR5	SEMICONO DEVICE (A6)	922-6131-010		25088	BB109-6131-010
C1	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V (A6)	913-4018-000		81349	CK05BX102K
C2	CAPACITOR,VAR AIR DIEL, 1 TO 10PF, 200V	922-0583-230		91293	5268
C3	CAPACITOR,FXD CER DIEL, 18PF, 10%, 75V	913-1098-030		72982	8101A075C0G0-180 K
C4	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104H
C5	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	199D106X0025CB1
C6	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C7	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C8	NOT USED				
C9	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		72136	DMSE270J050MV
C10	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C11	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104H
C12,C13	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C14	CAPACITOR,FXD CER DIEL, 47PF, PORM 0.25PF, 150V	913-1098-370		72982	8111B203C0G0470F J
C15	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V	912-4141-220		72136	DMSE330J050MV
C16	CAPACITOR,FXD MICA DIEL, 51PF, 5%, 50V	912-4141-300		72136	DMSE510J050MV
C17	CAPACITOR,FXD CER DIEL, 0.00068UF, 5%, 100V	913-3117-090		56289	2CC0G681X5100C4
C18	CAPACITOR,FXD CER DIEL, 270PF, 5%, 100V	913-1098-470		72982	8121M101C0G0-271 J
C19	CAPACITOR,FXD CER DIEL, 3PF, 0.25PF, 150V	913-1098-340		72982	8101B212C0J0309C
C20	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C21	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104H
C22	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C23	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C24	CAPACITOR,FXD MICA DIEL, 8PF, PORM 0.5PF, 300V (A6)	912-4141-110		72136	DMSC080D300MV
L1	COIL,RF 100UH	240-2047-000		96906	MS75085-07
L2	COIL,RF 2.70UH (A6)	240-2028-000		96906	MS75084-05
L3	COIL,RF 15UH	240-2037-000		96906	MS75084-14
L4	COIL,ADJUSTABLE	637-4502-001			
L5	COIL,RF 100UH	240-2047-000		96906	MS75085-07
L6	COIL,RF 1UH (A4)	240-2023-000		96906	MS75083-13
L7	COIL,RF 100UH	240-2047-000		96906	MS75085-07
L7,L8	COIL,RF 0.100UH	240-2723-140		96906	MS75083-1
Q1	TRANSISTOR (ESDS)	352-0756-050		17856	FN1905
Q2	TRANSISTOR	352-0440-000		07910	2N918
Q3,Q4	TRANSISTOR	352-0792-020		02735	2N5179
Q5	TRANSISTOR (ESDS)	352-0756-170		17856	FN1905
Q6	TRANSISTOR	352-0551-010		15818	2N2907A
Q7	TRANSISTOR	352-0915-030		22229	2N5116
R1	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R2	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	RN5506812F
R3	RESISTOR,FXD CHPSN, 560 OHMS, 10%, 1/4W	745-0740-000		81349	RCR07G561KS

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R1	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R2	RESISTOR,FXD FILM, 30.1K, 1%, 1/8W (A6)	705-1067-000		81349	RN5503012F
R2	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	RN5506812F
R3	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W (A6)	745-0749-000		81349	RCR07G102KS
R3	RESISTOR,FXD CHPSN, 560 OHMS, 10%, 1/4W	745-0740-000		81349	RCR07G561KS
R4	RESISTOR,VAR 1K, 10%, 0.5W (A11)	382-0027-070		80294	3329H1-102
	RESISTOR,TEST SELECT R4	638-6457-001			
R4	RESISTOR,FXD CHPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349	RCR07G151KS
R4	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/4W	745-0722-000		81349	RCR07G181KS
R4	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R4	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/4W	745-0731-000		81349	RCR07G331KS
R4	RESISTOR,FXD CHPSN, 390 OHMS, 5%, 1/4W	745-0733-000		81349	RCR07G391JS
R4	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR07G471KS
R4	RESISTOR,FXD CHPSN, 560 OHMS, 10%, 1/4W	745-0740-000		81349	RCR07G561KS
R5	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R6	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS
R7	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W	745-0755-000		81349	RCR07G152KS
R8	RESISTOR,FXD CHPSN, 2.2K, 10%, 1/4W	745-0761-000		81349	RCR07G222KS
R9	RESISTOR,FXD CHPSN, 68 OHMS, 10%, 1/4W (A5)	745-0707-000		81349	RCR07G680KS
R9	RESISTOR,FXD CHPSN, 22 OHMS, 10%, 1/4W	745-0689-000		81349	RCR07G220KS
R10	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W (A2)	745-0713-000		81349	RCR07G101KS
R10	RESISTOR,FXD,CHPSN, 100 THRU 390 OHMS, 10%, 1/4W (A5)	638-1088-001			
R10	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/4W	745-0722-000		81349	RCR07G181KS
R11	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/4W	745-0764-000		81349	RCR07G272KS
R12	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W (A2)	745-0743-000		81349	RCR07G681KS
R12	RESISTOR,FXD CHPSN, 560 OHMS, 10%, 1/4W	745-0740-000		81349	RCR07G561KS
R13	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R14	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0704-000		81349	RCR07G560KS
R15	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W (A3)(A4)	745-2304-000		81349	RCR05G101KS
	OR				
R15	RESISTOR,FXD CHPSN, 150 OHMS, 10%, 1/8W (A3)(A4)	745-2311-000		81349	RCR05G151KS
R16	RESISTOR,FXD CHPSN, 47 OHMS, 10%, 1/8W (A6)	745-2292-000		81349	RCR05G470KS
R17	RESISTOR,FXD CHPSN, 330 OHMS, 10%, 1/8W (A6)	745-2323-000		81349	RCR05G331KS
R18	RESISTOR,FXD CHPSN, 820 OHMS, 10%, 1/8W (A6)	745-2338-000		81349	RCR05G821KS
RT1	RESISTOR,THRM 220 OHMS, 10%, 1/2W	714-1721-000		10646	0325F5-015
T1	TRANSFORMER,RF (A5)	278-0430-200		03550	22488
T1	TRANSFORMER,RF	278-0430-290		03550	22511
T2	TRANSFORMER,RF	278-0430-200		03550	22488
	OUTPUT VCO BOARD A1A1 (ESDS)	638-6520-001 B			
CR1	SEMICONO DEVICE	922-6131-010		25088	BB109-6131-010
CR2	SEMICONO DEVICE (ESDS)	353-3691-010		28480	1N5711
CR3-CR5	SEMICONO DEVICE	922-6131-010		25088	BB109-6131-010
C1	NOT USED				
C2	CAPACITOR,VAR AIR DIEL, 1 TO 10PF, 200V	922-0583-230		91293	5268
C3	CAPACITOR,FXD CER DIEL, 18PF, 10%, 75V	913-1098-030		72982	8101A075C0G0-180 K
C4	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104H
C5	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	199D106X0025CB1
C6	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C7	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C8	NOT USED				
C9	CAPACITOR,FXD MICA DIEL, 27PF, 5%, 50V	912-4141-180		72136	DMSE270J050MV
C10	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C11	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104H
C12,C13	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C14	CAPACITOR,FXD CER DIEL, 47PF, PORM 0.25PF, 150V	913-1098-370		72982	8111B203C0G0470F J
C15	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V	912-4141-220		72136	DMSE330J050MV
C16	CAPACITOR,FXD MICA DIEL, 51PF, 5%, 50V	912-4141-300		72136	DMSE510J050MV
C17	CAPACITOR,FXD CER DIEL, 0.00068UF, 5%, 100V	913-3117-090		56289	2CC0G681X5100C4
C18	CAPACITOR,FXD CER DIEL, 270PF, 5%, 100V	913-1098-470		72982	8121M101C0G0-271 J
C19	CAPACITOR,FXD CER DIEL, 3PF, 0.25PF, 150V	913-1098-340		72982	8101B212C0J0309C
C20	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C21	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104H
C22	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C23	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C24	NOT USED				
C25	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-200		16546	CY30C104H
C26	CAPACITOR,FXD TMTLM ELCTLT, 0.47UF, 20%, 35V	184-9102-940		56289	199D474X9035AE1
C27	CAPACITOR,FXD ELCTLT, 2.2UF, 10%, 20V	184-9086-430		81349	13R0043-01-2283
L1	COIL,RF 100UH	240-2047-000		96906	MS75085-07
L2	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L3	COIL,ADJUSTABLE	637-4502-001			
L4	COIL,RF 100UH	240-2047-000		96906	MS75085-07
L5	NOT USED				
L6	COIL,RF 100UH	240-2047-000		96906	MS75085-07
L7,L8	COIL,RF 0.100UH	240-2723-140		96906	MS75083-1
Q1	TRANSISTOR (ESDS)	352-0756-170		17856	FN1905
Q2	TRANSISTOR	352-0440-000		07910	2N918
Q3,Q4	TRANSISTOR	352-0792-020		02735	2N5179
Q5	TRANSISTOR (ESDS)	352-0756-170		17856	FN1905
Q6	TRANSISTOR	352-0551-010		15818	2N2907A
Q7	TRANSISTOR	352-0915-030		22229	2N5116
R1	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R2	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	RN5506812F
R3	RESISTOR,FXD CHPSN, 560 OHMS, 10%, 1/4W	745-0740-000		81349	RCR07G561KS

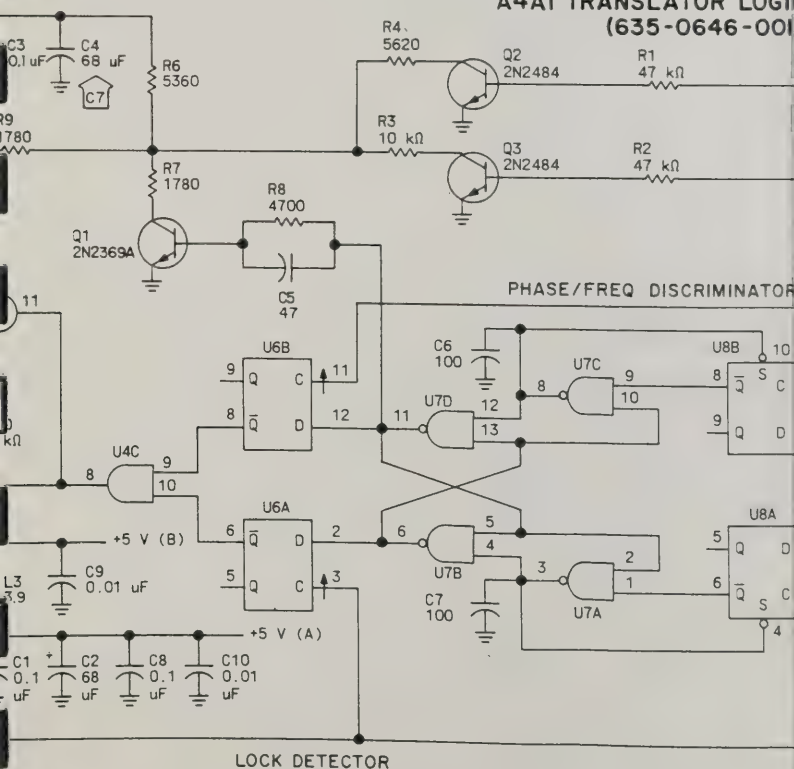
SLATOR VCO ASSY (37-1763-001)

LOW PASS FILTER



A4 TRANSLATOR LOGIC ASSY (635-0646-001)

A4A1 TRANSLATOR LOGIC ASSY (635-0646-001)

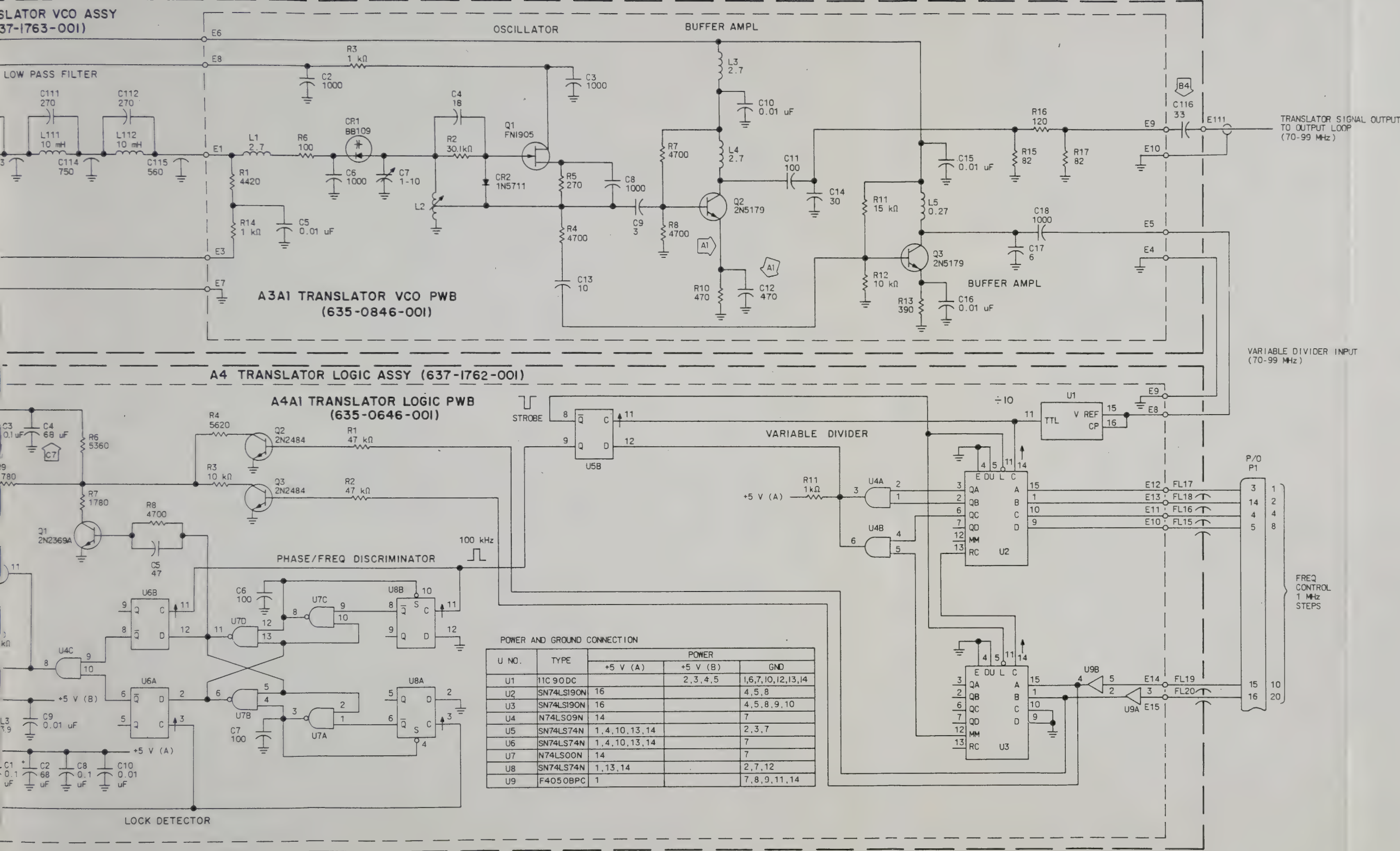


NOTES:

- 1 UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICO FARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS.
- 2 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
- 3 P1 IS ON CONNECTOR CARD 635-0998-001.
- 4 ALL UNMARKED SET AND RESET PINS ARE CONNECTED TO INACTIVE STATE AS SHOWN IN TABLES.
- 5 TEST SELECT:
A1A1 FROM 150 Ω TO 560 Ω A2 A5
A3 A4
- 6 APPLICABLE TO SYNTH OUTPUT MODULE 635-4930-001 ONLY.
- 7 APPLICABLE TO SYNTH OUTPUT MODULE 635-4930-002 ONLY.
- 8 THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

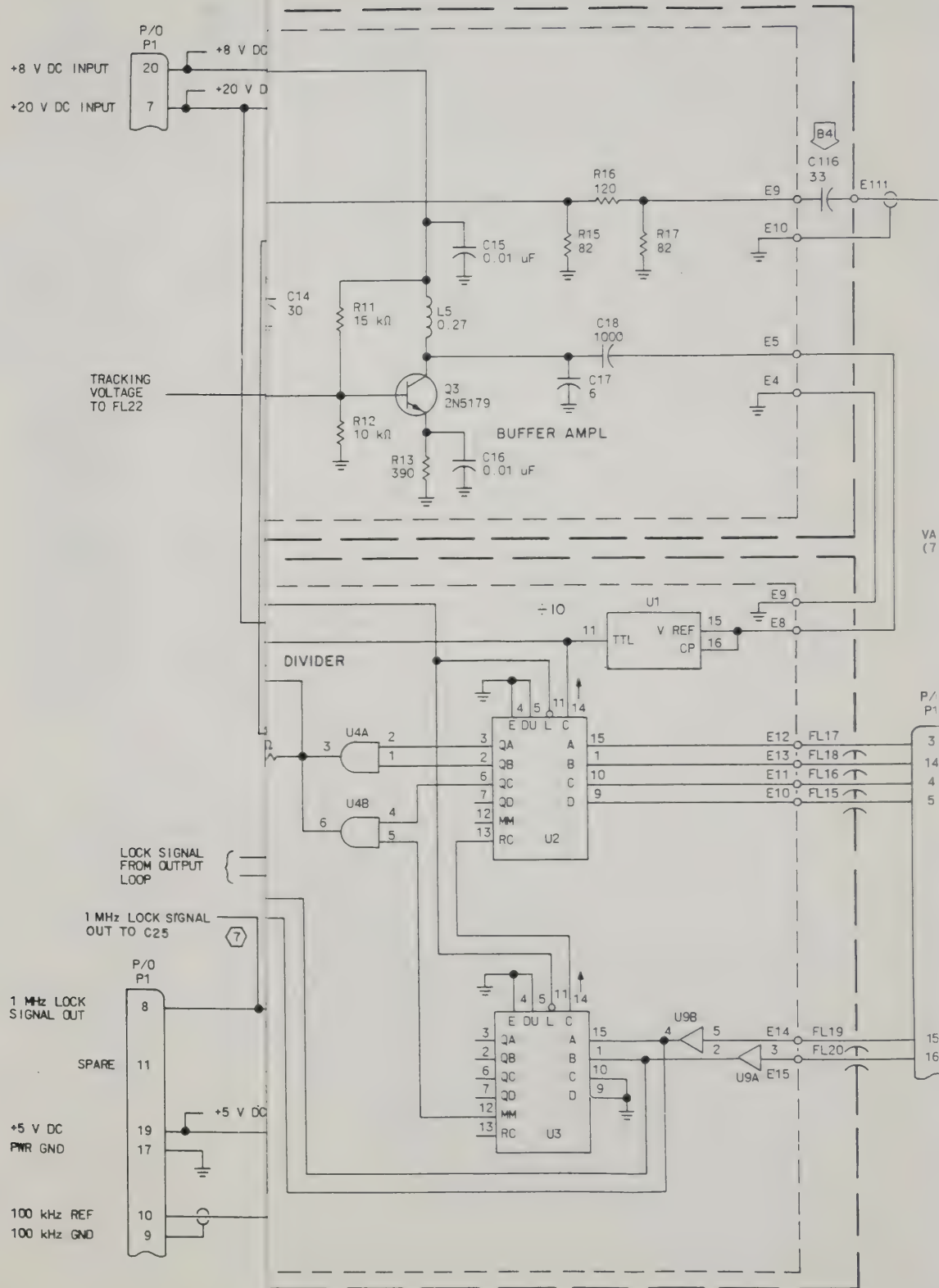
635-0426 SH 1

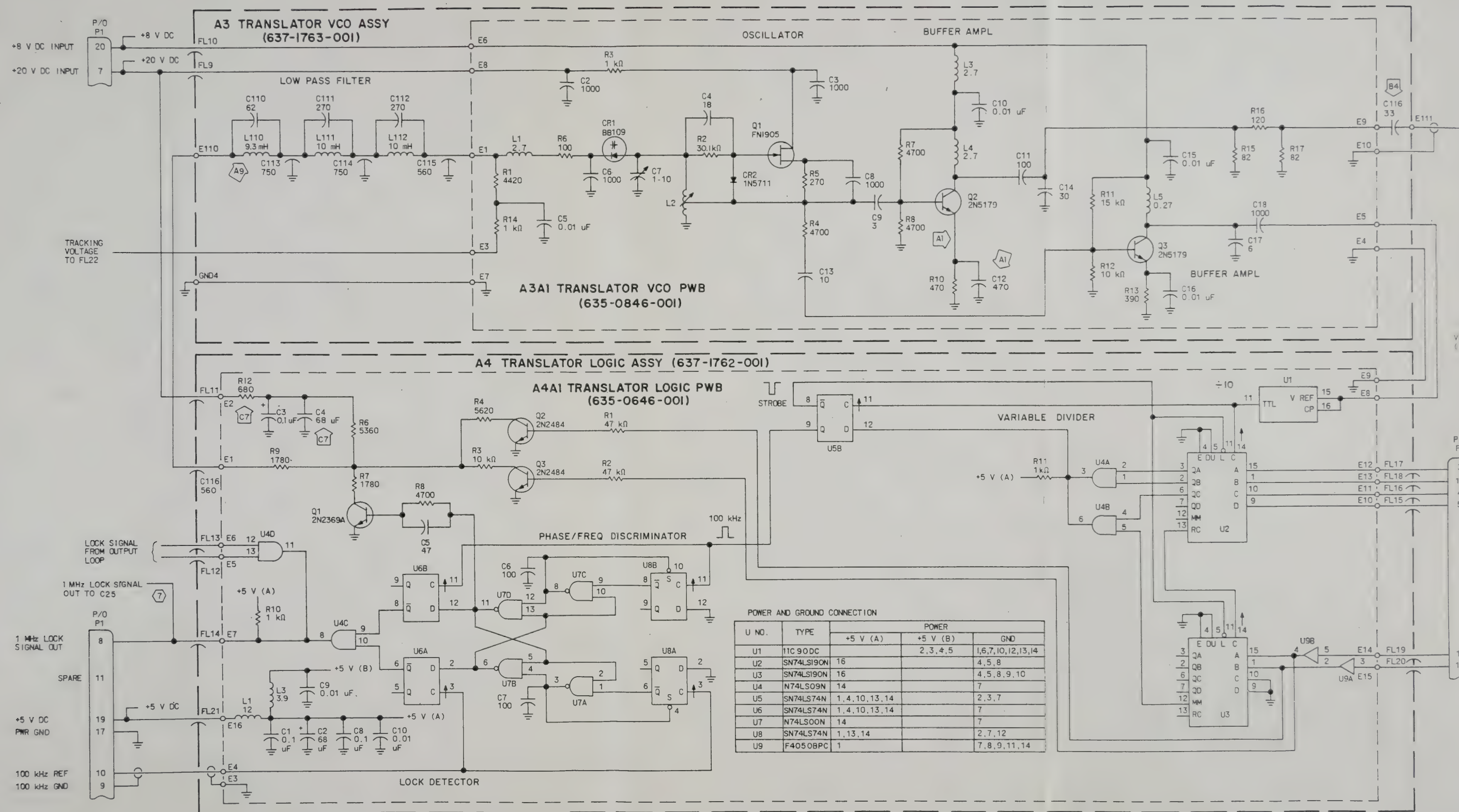
Synthesizer Output, Schematic Diagram
Figure 9 (Sheet 3)



- NOTES:
- 1 UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICO FARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS.
 - 2 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT AND/OR ASSEMBLY DESIGNATION.
 - 3 P1 IS ON CONNECTOR CARD 635-0998-001.
 - 4 ALL UNMARKED SET AND RESET PINS ARE CONNECTED TO INACTIVE STATE AS SHOWN IN TABLES.
 - 5 TEST SELECT A1A14 FROM 150Ω TO 560Ω
 - 6 APPLICABLE TO SYNTH OUTPUT MODULE 635-4930-001 ONLY.
 - 7 APPLICABLE TO SYNTH OUTPUT MODULE 635-4930-002 ONLY.
 - 8 THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.

Synthesizer Output, Schematic Diagram
Figure 9 (Sheet 3)





PARTS LIST (Cont)

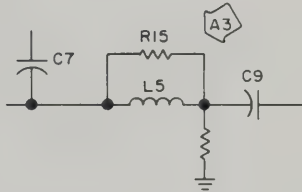
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PAR
R12	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR
R13	RESISTOR,FXD CMPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR
R14	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR
R15	RESISTOR,FXD CMPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR
R16	RESISTOR,FXD CMPSN, 120 OHMS, 10%, 1/4W	745-0716-000		81349	RCR
R17	RESISTOR,FXD CMPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR
	TRANSLATOR LOGIC A4 (ESDS)	637-1762-001			
A1	TRANSLATOR LOGIC BOARD (ESDS)	635-0646-001			
C1-C115	NOT USED				
C116	CAPACITOR,FXD MICA DIEL, 560PF, 5%, 500V	912-4114-320		81349	CB1
FL1-FL10	NOT USED				
FL11-FL21	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL3
	TRANSLATOR LOGIC BOARD A4A1 (ESDS)	635-0646-001			
C1	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY2
C2	CAPACITOR,FXD TMTLM ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	199
C3	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY2
C4	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V (C7)	184-9102-240		56289	199
C4	CAPACITOR,FXD TMTLM ELCTLT, 68UF, 20%, 25V	184-9102-280		56289	199
C5	CAPACITOR,FXD CER DIEL, 47PF, 10%, 75V	913-1098-020		72982	811
C6,C7	CAPACITOR,FXD CER DIEL, 100PF, PORM5%, 100V	913-3281-280		81349	CCR
C8	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY2
C9,C10	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY2
L1	COIL,RF 12UH	240-2036-000		96906	MS7
L2	COIL,RF 33UH (C7)	240-2041-000		96906	MS7
L3	COIL,RF 3.90UH	240-2030-000		96906	MS7
Q1	TRANSISTOR	352-0596-030		14433	2N2
Q2,Q3	TRANSISTOR	352-0549-000		07263	2N2
R1,R2	RESISTOR,FXD CMPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR
R3	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RNS
R4	RESISTOR,FXD FILM, 5.62K, 1%, 1/8W	705-1032-000		81349	RNS
R5	NOT USED				
R6	RESISTOR,FXD FILM, 5.36K, 1%, 1/8W	705-1031-000		81349	RNS
R7	RESISTOR,FXD FILM, 1.78K, 1%, 1/8W	705-1008-000		81349	RNS
R8	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR
R9	RESISTOR,FXD FILM, 1.78K, 1%, 1/8W	705-1008-000		81349	RNS
R10,R11	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR
R12	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/4W (C7)	745-0743-000		81349	RCR
U1	INTEGRATED CIRCUIT	351-1653-020		07263	11C
U2,U3	INTEGRATED CIRCUIT (ESDS)	351-1527-040		34335	SN74
U4	INTEGRATED CIRCUIT LOGIC GATE	351-1523-210		18324	N74
U5,U6	INTEGRATED CIRCUIT FLIP FLOP	351-1525-040		04713	SN74
U7	INTEGRATED CIRCUIT LOGIC GATE	351-1523-110		18324	N74
U8	INTEGRATED CIRCUIT FLIP FLOP	351-1525-040		04713	SN74
U9	INTEGRATED CIRCUIT (ESDS)	351-8159-220		07263	4050

matic Diagram
(t 4)

Revised 1 January 1981

PARTS LIST (Cont)					
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R12	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R13	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR07G391KS
R14	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R15	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR07G820KS
R16	RESISTOR,FXD CHPSN, 120 OHMS, 10%, 1/4W	745-0716-000		81349	RCR07G121KS
R17	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR07G820KS
A1	TRANSLATOR LOGIC A4 (ESDS)	637-1762-001			
C1-C115	TRANSLATOR LOGIC BOARD (ESDS)	635-0646-001			
FL1-FL10	NOT USED				
FL11-FL21	CAPACITOR,FXD MICA DIEL, 560PF, 5%, 500V	912-4114-320		81349	CB11RE561J
	NOT USED				
	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
	TRANSLATOR LOGIC BOARD A4A1 (ESDS)	635-0646-001			
C1	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY20C104M
C2	CAPACITOR,FXD THTLM ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	1990686X00060B1
C3	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY20C104M
C4	CAPACITOR,FXD THTLM ELCTLT, 10UF, 20%, 25V (C7)	184-9102-240		56289	1990106X0025CB1
C4	CAPACITOR,FXD THTLM ELCTLT, 68UF, 20%, 25V	184-9102-280		56289	19901011
C5	CAPACITOR,FXD CER DIEL, 47PF, 10%, 75V	913-1098-020		72982	8111A075C0G0-470K
C6,C7	CAPACITOR,FXD CER DIEL, 100PF, FORM5%, 100V	913-3281-280		81349	CCR19CG101J
C8	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY20C104M
C9,C10	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
L1	COIL,RF 12UH	240-2036-000		96906	MS75084-13
L2	COIL,RF 33UH (C7)	240-2041-000		96906	MS75085-01
L3	COIL,RF 3.90UH	240-2030-000		96906	MS75084-07
Q1	TRANSISTOR	352-0596-030		14433	2N2369A
Q2,Q3	TRANSISTOR	352-0549-000		07263	2N2484
R1,R2	RESISTOR,FXD CHPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473KS
R3	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F
R4	RESISTOR,FXD FILM, 5.62K, 1%, 1/8W	705-1032-000		81349	RN55D5621F
R5	NOT USED				
R6	RESISTOR,FXD FILM, 5.36K, 1%, 1/8W	705-1031-000		81349	RN55D5361F
R7	RESISTOR,FXD FILM, 1.78K, 1%, 1/8W	705-1008-000		81349	RN55D1781F
R8	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R9	RESISTOR,FXD FILM, 1.78K, 1%, 1/8W	705-1008-000		81349	RN55D1781F
R10,R11	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R12	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W (C7)	745-0743-000		81349	RCR07G681KS
U1	INTEGRATED CIRCUIT	351-1653-020		07263	11C90DC
U2,U3	INTEGRATED CIRCUIT (ESDS)	351-1527-040		34335	SN74LS190N
U4	INTEGRATED CIRCUIT LOGIC GATE	351-1523-210		18324	N74LS09N
U5,U6	INTEGRATED CIRCUIT FLIP FLOP	351-1525-040		04713	SN74LS74AN
U7	INTEGRATED CIRCUIT LOGIC GATE	351-1523-110		18324	N74LS00N
U8	INTEGRATED CIRCUIT FLIP FLOP	351-1525-040		04713	SN74LS74AN
U9	INTEGRATED CIRCUIT (ESDS)	351-8159-220		07263	4050BPC

MODIFICATION HISTORY		
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Removed A3A1R9, 100Ω from in series with A3A1Q2-E and junction of A3A1R10-A3A1C12. Changed A3A1C12 from 0.01μF to 470pF.	635-0846-001, REV B and above.
A2	Changed: A1A1R12 from 680Ω to 560Ω. A1A1R10 from 100Ω to test select of 100Ω to 390Ω.	635-0890-002, REV A and above.
A3	Added A1A1R15, test select of 100Ω or 150Ω.	635-0890-002, REV C and above.
A4	Removed A1A1L5, 1μH and A1A1R15, test select of 100Ω or 150Ω from circuit as shown below.	635-0890-002, REV E and above.
A5	Added A1A1Q5, FN1905 Changed: A1A1R9 from 68Ω to 22Ω A1A1R10 from test select of 100Ω to 390Ω; to 180Ω fixed. A1A1T1 changed from 278-0430-200 to 278-0430-290.	635-0890-002, REV E and above.
A6	Removed A1A1C1, 1000pF from A1A1CR1 cathode to ground. Removed A1A1C8, 15pF from A1A1Q3-B to ground. Changed: A1A1C6 from 1000pF to 470pF A1A1C9 from 1000pF to 27pF A1A1L2 from 2.7μH to 15μH A1A1R2 from 30.1kΩ to 68.1kΩ A1A1R3 from 1kΩ to 560Ω. Added A1A1CR3, BB109 Added A1A1CR4, BB109 Added A1A1CR5 BB109 Added A1A1C24, 8pF Added A1A1R16, 47Ω Added A1A1R17, 330Ω Added A1A1R18, 820Ω	635-0890-002, REV F and above.
A7	Added A1R15, 270Ω Added A1R16, 270Ω Added A1R17, 18Ω	635-1760-001, REV D and above.
A8	Changed A1C105 from 750pF to 1500pF.	637-1760-001, REV E and above.
A9	Changed A3L110 from 10mH to 9.3mH	637-1763-001, REV D and above.
A10	Changed A2A1R8 from 33.2kΩ to 21kΩ.	635-0836-001, REV B and above.



MODIFICATION HISTORY (Cont)		
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A11	Changed A1A1R14 from 1kΩ variable to test select of 150Ω to 560Ω.	635-0890-002 REV G and above.
B1	Added A2A2C12, 22pF.	635-0837-001 REV B and above.
B2	Added A2A1C14, 150pF. Changed A2A1L3 from 4.7μH and 100μH.	635-0836-001 REV C and above.
B3	Added A2L105, 100μH.	637-1761-001 REV E and above.
B4	Added A3C116, 33pF.	637-1763-001 REV F and above.
C1	Changed: A2A1R1 from 470Ω to 1500Ω. A2A1R2 from 470Ω to 1kΩ.	635-0836-001 REV D and above.
C2	Changed: A2A2C12 from 22pF to 8pF. A2A2R10 from 1kΩ to 1500Ω.	635-0837-001, REV C and above.
C3	Changed: A2L103 from 10μH to 12μH. A2L104 from 10μH to 22μH.	637-1761-001, REV H and above.
C4	Changed: A2A1R1 from 1500Ω, 1/4 W to 1500Ω, 1/8 W. A2A1R2 from 1kΩ, 1/4 W to 1kΩ, 1/8 W.	635-0836-001, REV E and above.
C5	Changed A2A2R10 from 1500Ω, 1/4 W to 1500Ω, 1/8 W.	635-0837-001, REV D and above.
C6	Changed: A1A1R6 from 2700Ω to 1500Ω A1A1R10 from 68Ω to 120Ω A1A1T1 from 278-0430-290 to 278-0444-001.	638-6520-001, REV C and above.
C7	Changed: A4A1L2 from 33μH to A4A1R12, 680Ω. A4A1C4 from 10μF to 68μF.	635-0646-001 REV E and above. (SB 53)

Synthesizer Output, Schematic Diagram
Figure 9 (Sheet 4)

PARTS LIST (Cont)

MODIFICATION HISTORY (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR COD	EFFECTIVITY	REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTI
	OUTPUT MIXER BOARD A2A2 (ESDS)	635-0837-001			635-0846-001, REV B and above.	A11	Changed A1A134 from 1k Ω variable to test select of 150 Ω to 560 Ω .	635-0890-001, REV G and above.
C1	CAPACITOR,FXD MICA DIEL, 10PF, FORM 0.5PF, 300V	912-4141-020		7213				
C2,C3	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134		B1	Added A2A2C12, 22pF.	635-0837-001, REV B and above.
C4	CAPACITOR,FXD CER DIEL, 0.1UF, FORM10%, 50V	913-5019-320		8134				
C5	CAPACITOR,FXD MICA DIEL, 5PF, FORM 0.5PF, 300V	912-4141-010		7213				
C6	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134	635-0890-002.			
C7	CAPACITOR,FXD TMTM ELCTLT, 10UF, 20%, 25V	184-9102-240		5628	REV A			
C8-C10	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		8134	and above.	B2	Added A2A1C14, 150pF. Changed A2A1L3 from 4.7 μ H and 100 μ H.	635-0837-001, REV C and above.
C11	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134				
C12	CAPACITOR,FXD MICA DIEL, 22PF, FORM 0.5PF, 300V (B1)(C2)	912-4141-030		7213				
C12	CAPACITOR,FXD MICA DIEL, 8PF, FORM 0.5PF, 300V	912-4141-110		7213	635-0890-002.			
L1	NOT USED				REV C	B3	Added A2L105, 100 μ H.	637-1761-001, REV E and above.
L2	COIL,RF 0.18UH	240-2014-000		9690	and above.			
Q1	TRANSISTOR	352-0792-020		0273				
Q2	TRANSISTOR (ESDS)	352-1093-010		0273				
R1	NOT USED				635-0890-002.			
R2	RESISTOR,FXD CMPSN, 2.7K, 10%, 1/8W	745-2356-000		8134	REV E	B4	Added A3C116, 33pF.	637-1763-001, REV F and above.
R3	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/8W	745-2335-000		8134	and above.			
R4	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/8W	745-2304-000		8134				
R5	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/8W	745-2317-000		8134				
R6	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/8W	745-2304-000		8134				
R7	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		8134		C1	Changed: A2A1R1 from 470 Ω to 1500 Ω . A2A1R2 from 470 Ω to 1k Ω .	635-0837-001, REV D and above.
R8	RESISTOR,FXD CMPSN, 180 OHMS, 10%, 1/8W	745-2314-000		8134				
R9	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		8134				
R10	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W (C2)	745-2341-000		8134				
R10	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/4W (C5)	745-0755-000		8134				
R10	RESISTOR,FXD CMPSN, 1.5K, 10%, 1/8W	745-2347-000		8134		C2	Changed: A2A2C12 from 22pF to 8pF. A2A2R10 from 1k Ω to 1500 Ω .	635-0837-001, REV C and above.
R11	RESISTOR,FXD CMPSN, 56 OHMS, 10%, 1/8W	745-2295-000		8134				
	TRANSLATOR VCO A3 (ESDS)	637-1763-001						
A1	TRANSLATOR VCO BOARD (ESDS)	635-0846-001						
C1-C109	NOT USED					C3	Changed: A2L103 from 10 μ H to 12 μ H. A2L104 from 10 μ H to 22 μ H.	637-1761-001, REV H and above.
C110	CAPACITOR,FXD MICA DIEL, 62PF, 5%, 50V	912-4141-320		7213				
C111	CAPACITOR,FXD CER DIEL, 270PF, 5%, 100V	913-1098-470		7298	635-0890-002.			
C112					REV E			
C113	CAPACITOR,FXD MICA DIEL, 750PF, 5%, 500V	912-4114-350		8134	and above.	C4	Changed: A2A1R1 from 1500 Ω , 1/4 W to 1500 Ω , 1/8 W. A2A1R2 from 1k Ω , 1/4 W to 1k Ω , 1/8 W.	635-0837-001, REV E and above.
C114								
C115	CAPACITOR,FXD MICA DIEL, 560PF, 5%, 500V	912-4114-320		8134				
C116	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V (B4)	912-4141-220		7213				
FL1-FL3	NOT USED							
FL9,FL10	FILTER,RAD INTR 1750PF	241-5006-010		8134				
L1-L109	NOT USED							
L110	COIL,RF 10000UH (A9)	240-2715-610		9690				
L110	COIL,WH, 0093H	634-5339-001		9690	635-0890-002.	C5	Changed A2A2R10 from 1500 Ω , 1/4 W to 1500 Ω , 1/8 W.	635-0837-001, REV D and above.
L111	COIL,RF 10000UH	240-2715-610		9690	REV F and above.			
L112								
	TRANSLATOR VCO BOARD A3A1 (ESDS)	635-0846-001						
CR1	SEMICONV DEVICE	922-6131-010		2508		C6	Changed: A1A1R6 from 2700 Ω to 1500 Ω A1A1R10 from 68 Ω to 120 Ω A1A1T1 from 278-0430-290 to 278-0444-001.	638-6520-001, REV C and above.
CR2	SEMICONV DEVICE (ESDS)	353-3691-010		2846				
C1	NOT USED							
C2,C3	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134				
C4	CAPACITOR,FXD CER DIEL, 18PF, 10%, 75V	913-1098-030		7298				
C5	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		8134				
C6	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134		C7	Changed: A4A1L2 from 33 μ H to A4A1R12, 680 Ω . A4A1C4 from 10 μ F to 68 μ F.	635-0646-001, REV E and above. (SB 53)
C7	CAPACITOR,VAR AIR DIEL, 1 TO 10PF, 200V	922-0583-230		9129				
C8	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134				
C9	CAPACITOR,FXD MICA DIEL, 3PF, FORM 0.5PF, 300V	912-4141-070		7213				
C10	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		8134				
C11	CAPACITOR,FXD CER DIEL, 100PF, FORM5%, 100V	913-3281-280		8134				
C12	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V (A1)	913-5019-200		8134				
C12	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		8134				
C13	CAPACITOR,FXD CER DIEL, 10PF, 5%, 75V	913-1098-010		7298				
C14	CAPACITOR,FXD MICA DIEL, 30PF, 5%, 50V	912-4141-200		7213	635-1760-001.			
C15,C16	CAPACITOR,FXD CER DIEL, 0.01UF, FORM10%, 100V	913-5019-200		8134	REV D			
C17	CAPACITOR,FXD MICA DIEL, 6PF, FORM 0.5PF, 300V	912-4141-090		7213	and above.			
C18	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		8134				
L1	COIL,RF 2.70UH	240-2028-000		9690	637-1760-001.			
L2	COIL,ADJUSTABLE	635-9660-001			REV E			
L3,L4	COIL,RF 2.70UH	240-2028-000		9690	and above.			
L5	COIL,RF 0.27UH	240-2016-000		9690				
Q1	TRANSISTOR (ESDS)	352-0756-050		1785				
Q2,Q3	TRANSISTOR	352-0792-020		0273				
R1	RESISTOR,FXD FILM, 4.42K, 1%, 1/8W	705-1027-000		8134	637-1763-001.			
R2	RESISTOR,FXD FILM, 30.1K, 1%, 1/8W	705-1067-000		8134	REV D			
R3	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		8134	and above.			
R4	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		8134				
R5	RESISTOR,FXD CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		8134				
R6	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		8134	635-0836-001.			
R7,R8	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		8134	REV B			
R9	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W (A1)	745-0713-000		8134	and above.			
R10	RESISTOR,FXD CMPSN, 470 OHMS, 10%, 1/4W	745-0737-000		8134				
R11	RESISTOR,FXD CMPSN, 15K, 10%, 1/4W	745-0791-000		8134				

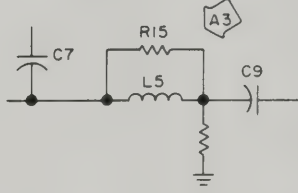
PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	OUTPUT MIXER BOARD A2A2 (ESDS)	635-0837-001			
C1	CAPACITOR,FXD MICA DIEL, 10PF, PORM 0.5PF, 300V	912-4141-020		72136	DM5C100D300WV
C2,C3	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C4	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 50V	913-5019-320		81349	CK05BX104K
C5	CAPACITOR,FXD MICA DIEL, 5PF, PORM 0.5PF, 300V	912-4141-010		72136	DM5C050D300WV
C6	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C7	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V	184-9102-240		56289	199D106X0025CB1
C8-C10	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C11	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C12	CAPACITOR,FXD MICA DIEL, 22PF, PORM 0.5PF, 300V (B1)(C2)	912-4141-030		72136	DM5E220D300WV
C12	CAPACITOR,FXD MICA DIEL, 8PF, PORM 0.5PF, 300V	912-4141-110		72136	DM5C080D300WV
L1	NOT USED				
L2	COIL,RF 0.18UH	240-2014-000		96906	MS75083-04
Q1	TRANSISTOR	352-0792-020		02735	2N5179
Q2	TRANSISTOR (ESDS)	352-1093-010		02735	3N187
R1	NOT USED				
R2	RESISTOR,FXD CHPSN, 2.7K, 10%, 1/8W	745-2356-000		81349	RCR05G272KS
R3	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/8W	745-2335-000		81349	RCR05G681KS
R4	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101KS
R5	RESISTOR,FXD CHPSN, 220 OHMS, 10%, 1/8W	745-2317-000		81349	RCR05G221KS
R6	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101KS
R7	RESISTOR,FXD CHPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R8	RESISTOR,FXD CHPSN, 180 OHMS, 10%, 1/8W	745-2314-000		81349	RCR05G181KS
R9	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R10	RESISTOR,FXD CHPSN, 1K, 10%, 1/8W (C2)	745-2341-000		81349	RCR05G102KS
R10	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/4W (C5)	745-0755-000		81349	RCR07G152KS
R10	RESISTOR,FXD CHPSN, 1.5K, 10%, 1/8W	745-2347-000		81349	RCR05G152KS
R11	RESISTOR,FXD CHPSN, 56 OHMS, 10%, 1/8W	745-2295-000		81349	RCR05G560KS
	TRANSLATOR VCO A3 (ESDS)	637-1763-001			
A1	TRANSLATOR VCO BOARD (ESDS)	635-0846-001			
C1-C109	NOT USED				
C110	CAPACITOR,FXD MICA DIEL, 62PF, 5%, 50V	912-4141-320		72136	DM5E620J050WV
C111,	CAPACITOR,FXD CER DIEL, 270PF, 5%, 100V	913-1098-470		72982	8121M101C0G0-271
C112					
C113,	CAPACITOR,FXD MICA DIEL, 750PF, 5%, 500V	912-4114-350		81349	CB11RE751J
C114					
C115	CAPACITOR,FXD MICA DIEL, 560PF, 5%, 500V	912-4114-320		81349	CB11RE561J
C116	CAPACITOR,FXD MICA DIEL, 33PF, 5%, 50V (B4)	912-4141-220		72136	DM5E330J050WV
FL1-FL8	NOT USED				
FL9,FL10	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
L1-L109	NOT USED				
L110	COIL,RF 10000UH (A9)	240-2715-610		96906	MS75089-35
L110	COIL,MM, .0093H	634-5339-001			
L111,	COIL,RF 10000UH	240-2715-610		96906	MS75089-35
L112					
	TRANSLATOR VCO BOARD A3A1 (ESDS)	635-0846-001			
CR1	SEMICONV DEVICE	922-6131-010		25088	BB109-6131-010
CR2	SEMICONV DEVICE (ESDS)	353-3691-010		28480	1N5711
C1	NOT USED				
C2,C3	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C4	CAPACITOR,FXD CER DIEL, 18PF, 10%, 75V	913-1098-030		72982	8101A075C0G0-180
C5	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C6	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C7	CAPACITOR,VAR AIR DIEL, 1 TO 10PF, 200V	922-0583-230		91293	5268
C8	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C9	CAPACITOR,FXD MICA DIEL, 3PF, PORM 0.5PF, 300V	912-4141-070		72136	DM5C030D300WV
C10	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C11	CAPACITOR,FXD CER DIEL, 100PF, PORM5%, 100V	913-3281-280		81349	CCR19CG101J
C12	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V (A1)	913-5019-200		81349	CK05BX103K
C12	CAPACITOR,FXD CER DIEL, 470PF, 10%, 200V	913-4014-000		81349	CK05BX471K
C13	CAPACITOR,FXD CER DIEL, 10PF, 5%, 75V	913-1098-010		72982	8101A075C0G0-100
C14	CAPACITOR,FXD MICA DIEL, 30PF, 5%, 50V	912-4141-200		72136	DM5E300J050WV
C15,C16	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C17	CAPACITOR,FXD MICA DIEL, 6PF, PORM 0.5PF, 300V	912-4141-090		72136	DM5C060D300WV
C18	CAPACITOR,FXD CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
L1	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L2	COIL,ADJUSTABLE	635-9660-001			
L3,L4	COIL,RF 2.70UH	240-2028-000		96906	MS75084-05
L5	COIL,RF 0.27UH	240-2016-000		96906	MS75083-06
Q1	TRANSISTOR (ESDS)	352-0756-050		17856	FN1905
Q2,Q3	TRANSISTOR	352-0792-020		02735	2N5179
R1	RESISTOR,FXD FILM, 4.42K, 1%, 1/8W	705-1027-000		81349	RN5504421F
R2	RESISTOR,FXD FILM, 30.1K, 1%, 1/8W	705-1067-000		81349	RN5503012F
R3	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R4	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R5	RESISTOR,FXD CHPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R6	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R7,R8	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R9	RESISTOR,FXD CHPSN, 100 OHMS, 10%, 1/4W (A1)	745-0713-000		81349	RCR07G101KS
R10	RESISTOR,FXD CHPSN, 470 OHMS, 10%, 1/4W	745-0737-000		81349	RCR07G471KS
R11	RESISTOR,FXD CHPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR07G153KS

PARTS LIST (Cont)

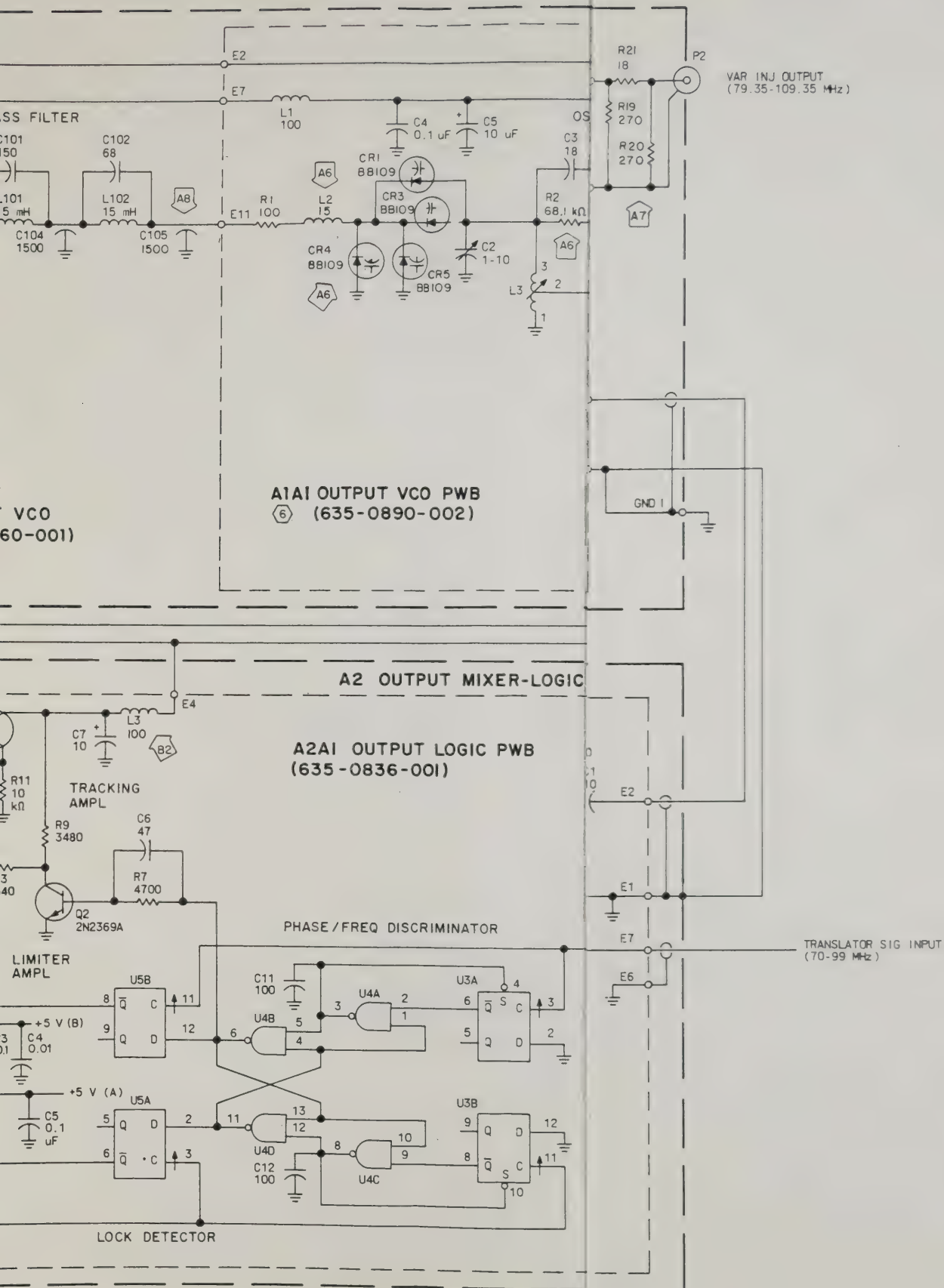
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R12	RESISTOR,FXD CHPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R13	RESISTOR,FXD CHPSN, 390 OHMS, 10%, 1/4W	745-0734-000		81349	RCR07G391KS
R14	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R15	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR07G820KS
R16	RESISTOR,FXD CHPSN, 120 OHMS, 10%, 1/4W	745-0716-000		81349	RCR07G121KS
R17	RESISTOR,FXD CHPSN, 82 OHMS, 10%, 1/4W	745-0710-000		81349	RCR07G820KS
	TRANSLATOR LOGIC A4 (ESDS)	637-1762-001			
A1	TRANSLATOR LOGIC BOARD (ESDS)	635-0646-001			
C1-C115	NOT USED				
C116	CAPACITOR,FXD MICA DIEL, 560PF, 5%, 500V	912-4114-320		81349	CB11RE561J
FL1-FL10	NOT USED				
FL11-FL21	FILTER,RAD INTR 1750PF	241-5006-010		81349	FL38GW1ED3-0001
	TRANSLATOR LOGIC BOARD A4A1 (ESDS)	635-0646-001			
C1	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY20C104M
C2	CAPACITOR,FXD TMTLM ELCTLT, 68UF, 20%, 6V	184-9102-040		56289	199D686X0006DB1
C3	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY20C104M
C4	CAPACITOR,FXD TMTLM ELCTLT, 10UF, 20%, 25V (C7)	184-9102-240		56289	199D106X0025CB1
C5	CAPACITOR,FXD CER DIEL, 47PF, 10%, 75V	913-1098-020		72982	8111A075C0G0-470
C6,C7	CAPACITOR,FXD CER DIEL, 100PF, PORM5%, 100V	913-3281-280		81349	CCR19CG101J
C8	CAPACITOR,FXD CER DIEL, 0.1UF, 20%, 50V	913-3279-180		16546	CY20C104M
C9,C10	CAPACITOR,FXD CER DIEL, 0.01UF, 20%, 50V	913-3279-110		16546	CY20C103M
L1	COIL,RF 12UH	240-2036-000		96906	MS75084-13
L2	COIL,RF 33UH (C7)	240-2041-000		96906	MS75085-01
L3	COIL,RF 3.90UH	240-2030-000		96906	MS75084-07
Q1	TRANSISTOR	352-0596-030		14433	2N2369A
Q2,Q3	TRANSISTOR	352-0549-000		07263	2N2484
R1,R2	RESISTOR,FXD CHPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473KS
R3	RESISTOR,FXD FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55011002F
R4	RESISTOR,FXD FILM, 5.62K, 1%, 1/8W	705-1032-000		81349	RN5505621F
R5	NOT USED				
R6	RESISTOR,FXD FILM, 5.36K, 1%, 1/8W	705-1031-000		81349	RN5505361F
R7	RESISTOR,FXD FILM, 1.78K, 1%, 1/8W	705-1008-000		81349	RN5501781F
R8	RESISTOR,FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R9	RESISTOR,FXD FILM, 1.78K, 1%, 1/8W	705-1008-000		81349	RN5501781F
R10,R11	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W (C7)	745-0749-000		81349	RCR07G102KS
R12	RESISTOR,FXD CHPSN, 1K, 10%, 1/4W	745-0743-000		81349	RCR07G681KS
U1	INTEGRATED CIRCUIT	351-1653-020		07263	11C90DC
U2,U3	INTEGRATED CIRCUIT (ESDS)	351-1527-040		34335	SN74LS190H
U4	INTEGRATED CIRCUIT LOGIC GATE	351-1523-210		18324	N74LS09N
U5,U6	INTEGRATED CIRCUIT FLIP FLOP	351-1525-040		04713	SN74LS74AN
U7	INTEGRATED CIRCUIT LOGIC GATE	351-1523-110		18324	N74LS00N
U8	INTEGRATED CIRCUIT FLIP FLOP	351-1525-040		04713	SN74LS74AN
U9	INTEGRATED CIRCUIT (ESDS)	351-8159-220		07263	4050BPC

MODIFICATION HISTORY

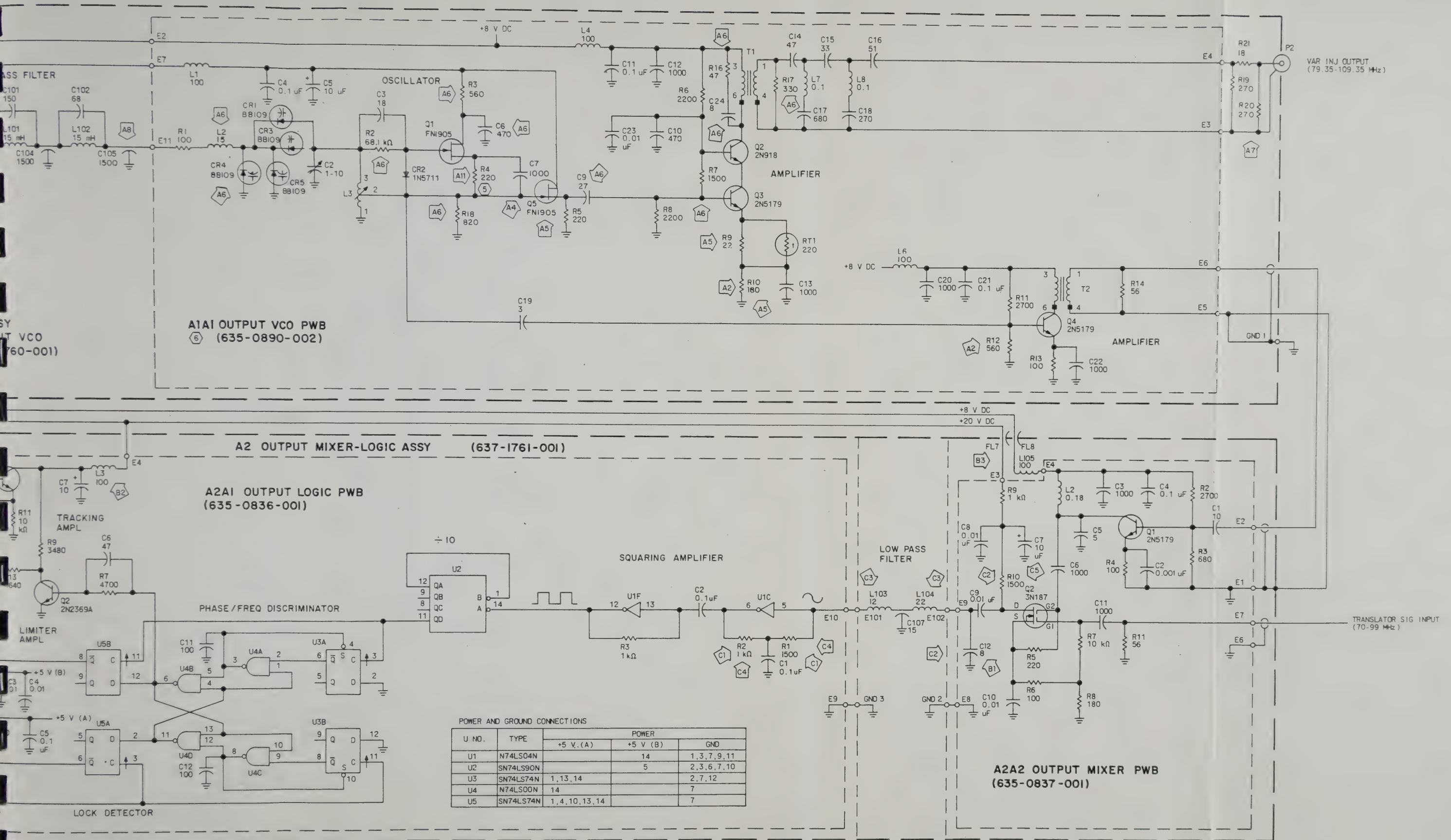
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Removed A3A1R9, 100Ω from in series with A3A1Q2-E and junction of A3A1R10-A3A1C12. Changed A3A1C12 from 0.01μF to 470pF.	635-0846-001, REV B and above.
A2	Changed: A1A1R12 from 680Ω to 560Ω. A1A1R10 from 100Ω to test select of 100Ω to 390Ω.	635-0890-002, REV A and above.
A3	Added A1A1R15, test select of 100Ω or 150Ω.	635-0890-002, REV C and above.
A4	Removed A1A1L5, 1μH and A1A1R15, test select of 100Ω or 150Ω from circuit as shown below.	635-0890-002, REV E and above.
		
A5	Added A1A1Q5, FN1905 Changed: A1A1R9 from 68Ω to 22Ω A1A1R10 from test select of 100Ω to 390Ω; to 180Ω fixed. A1A1T1 changed from 278-0430-200 to 278-0430-290.	635-0890-002, REV E and above.
A6	Removed A1A1C1, 1000pF from A1A1CR1 cathode to ground. Removed A1A1C8, 15pF from A1A1Q3-B to ground. Changed: A1A1C6 from 1000pF to 470pF A1A1C9 from 1000pF to 27pF A1A1L2 from 2.7μH to 15μH A1A1R2 from 30.1kΩ to 68.1kΩ A1A1R3 from 1kΩ to 560Ω. Added A1A1CR3, BB109 Added A1A1CR4, BB109 Added A1A1CR5 BB109 Added A1A1C24, 8pF Added A1A1R16, 47Ω Added A1A1R17, 330Ω Added A1A1R18, 820Ω	635-0890-002, REV F and above.
A7	Added A1R15, 270Ω Added A1R16, 270Ω Added A1R17, 18Ω	635-1760-001, REV D and above.
A8	Changed A1C105 from 750pF to 1500pF.	637-1760-001, REV E and above.
A9	Changed A3L110 from 10mH to 9.3mH	637-1763-001, REV D and above.
A10	Changed A2A1R8 from 33.2kΩ to 21kΩ.	635-0836-001, REV B and above.

MODIFICATION HISTORY (Cont)

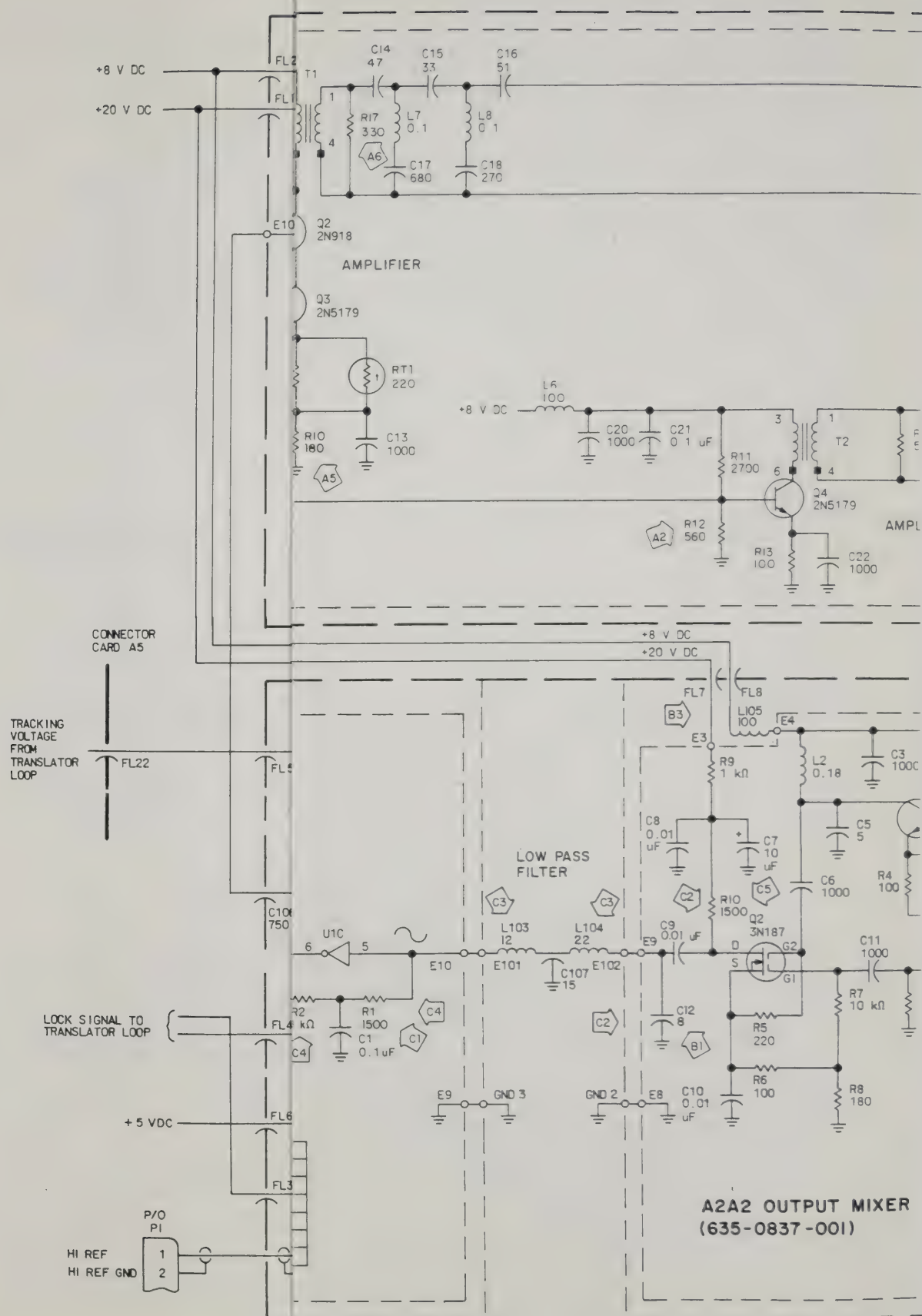
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTI
A11	Changed A1A1R4 from 1kΩ variable to test select of 150Ω to 560Ω.	635-0890-001, REV G and above.
B1	Added A2A2C12, 22pF.	635-0831-001, REV B and above.
B2	Added A2A1C14, 150pF. Changed A2A1L3 from 4.7μH and 100μH.	635-0836-001, REV C and above.
B3	Added A2L105, 100μH.	637-1761-001, REV E and above.
B4	Added A3C116, 33pF.	637-1763-001, REV F and above.
C1	Changed: A2A1R1 from 470Ω to 1500Ω. A2A1R2 from 470Ω to 1kΩ.	635-0836-001, REV D and above.
C2	Changed: A2A2C12 from 22pF to 8pF. A2A2R10 from 1kΩ to 1500Ω.	635-0837-001, REV C and above.
C3	Changed: A2L103 from 10μH to 12μH. A2L104 from 10μH to 22μH.	637-1761-001, REV H and above.
C4	Changed: A2A1R1 from 1500Ω, 1/4 W to 1500Ω, 1/8 W. A2A1R2 from 1kΩ, 1/4 W to 1kΩ, 1/8 W.	635-0836-001, REV E and above.
C5	Changed A2A2R10 from 1500Ω, 1/4 W to 1500Ω, 1/8 W.	635-0837-001, REV D and above.
C6	Changed: A1A1R6 from 2700Ω to 1500Ω A1A1R10 from 68Ω to 120Ω A1A1T1 from 278-0430-290 to 278-0444-001.	638-6520-001, REV C and above.
C7	Changed: A4A1L2 from 33μH to A4A1R12, 680Ω. A4A1C4 from 10μF to 68μF.	635-0646-001, REV E and above (SB 53)

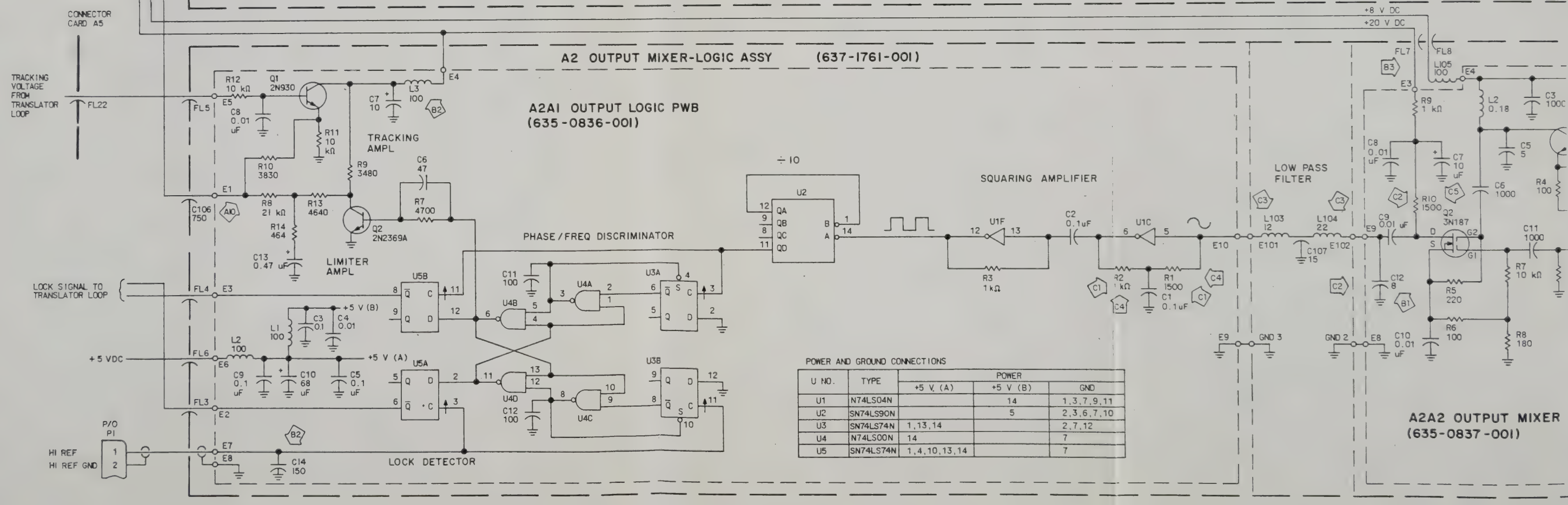
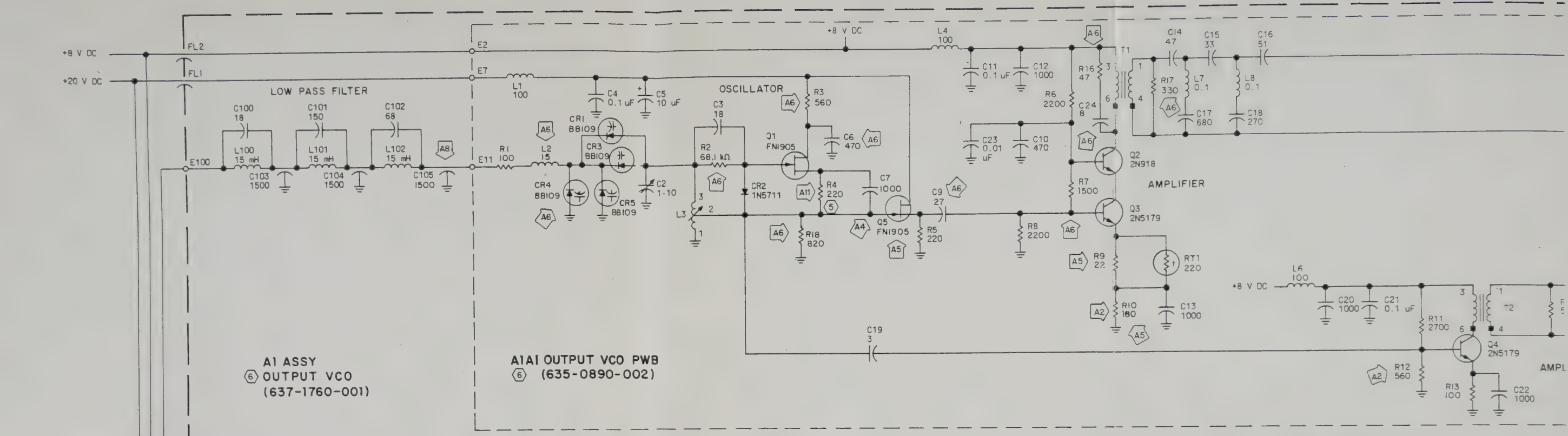


*Synthesizer Output (635-4930-001 only), Schematic Diagram
Figure 9 (Sheet 5)*



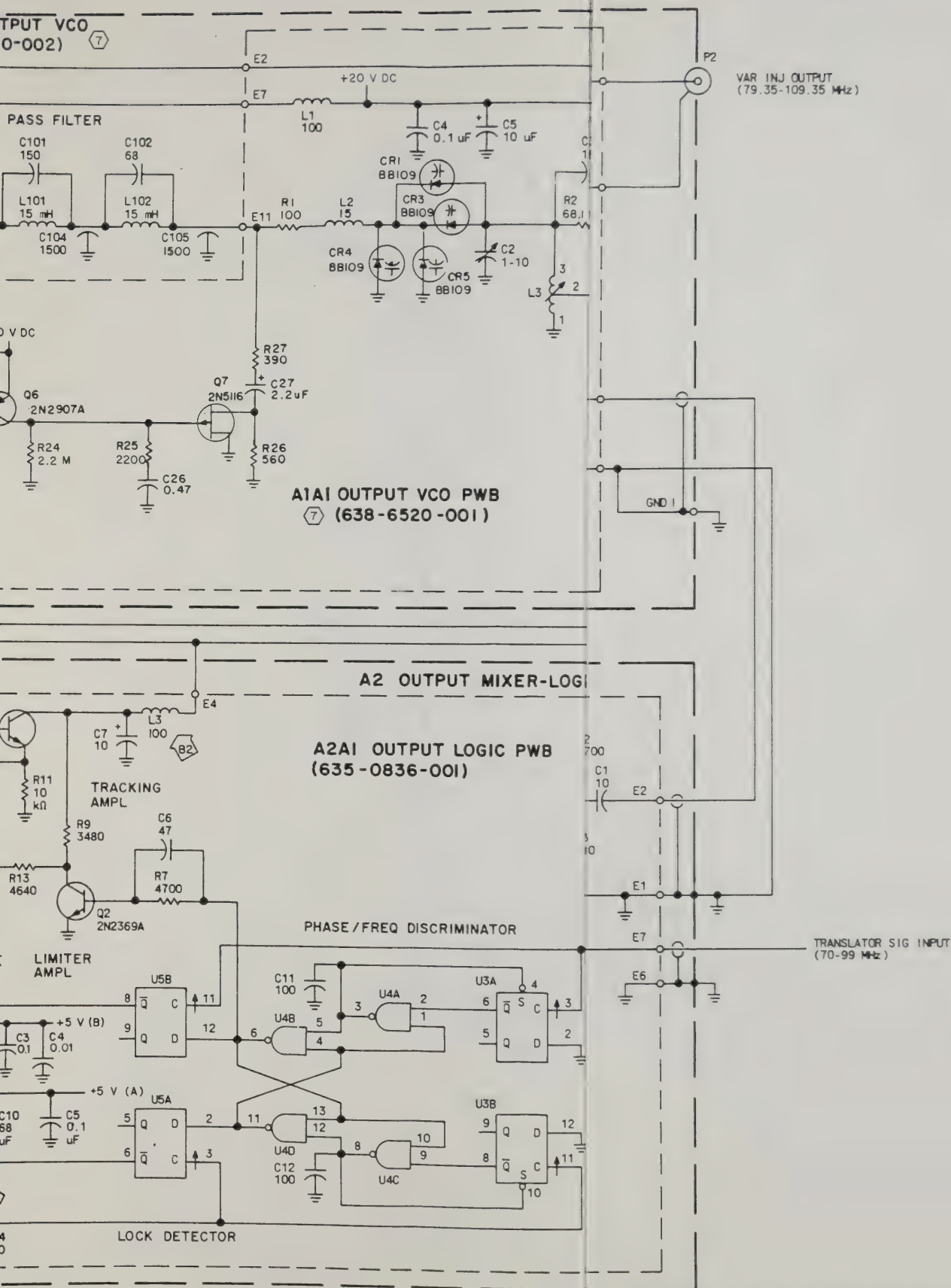
Synthesizer Output (635-4930-001 only), Schematic Diagram
Figure 9 (Sheet 5)





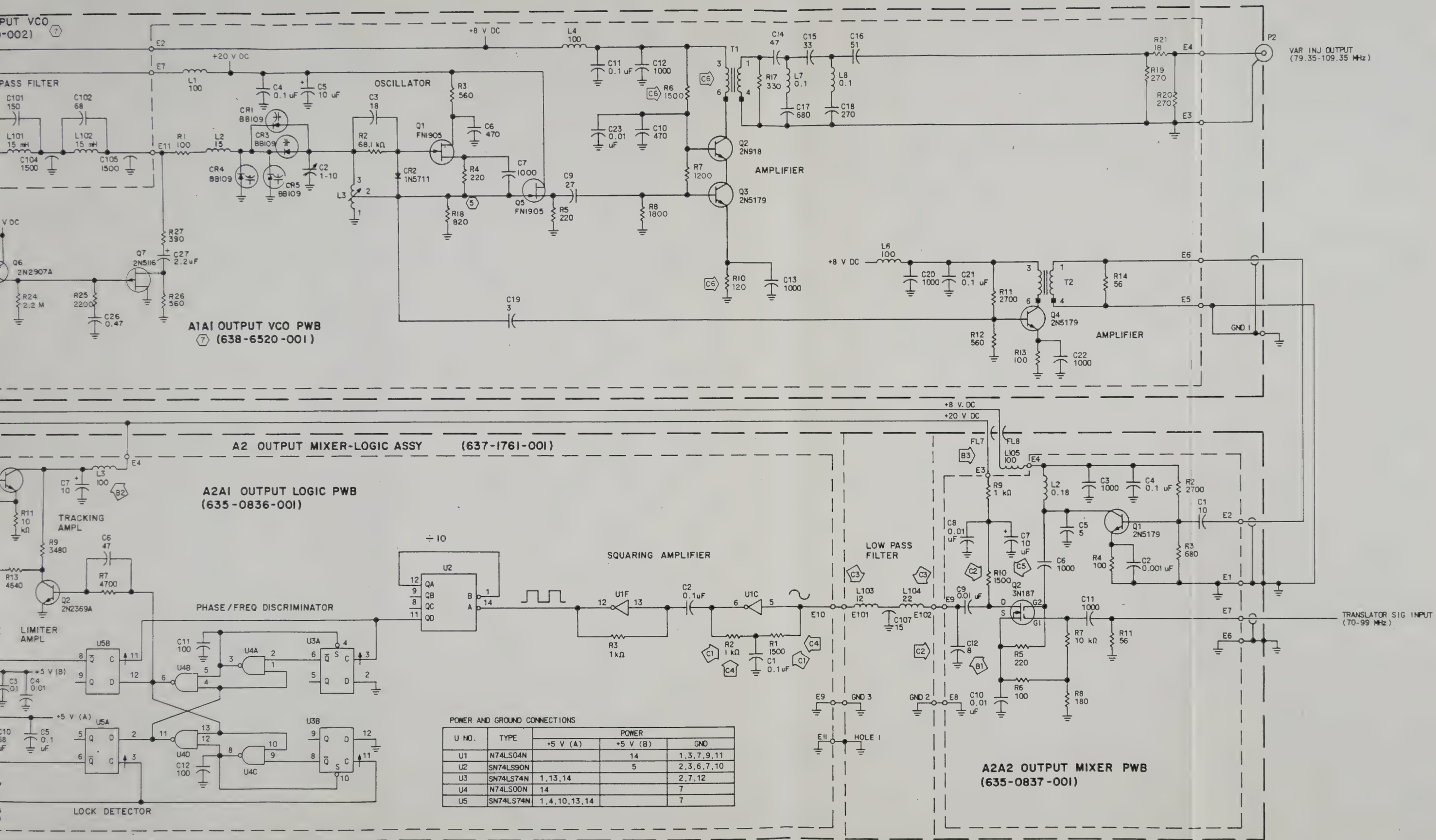
POWER AND GROUND CONNECTIONS

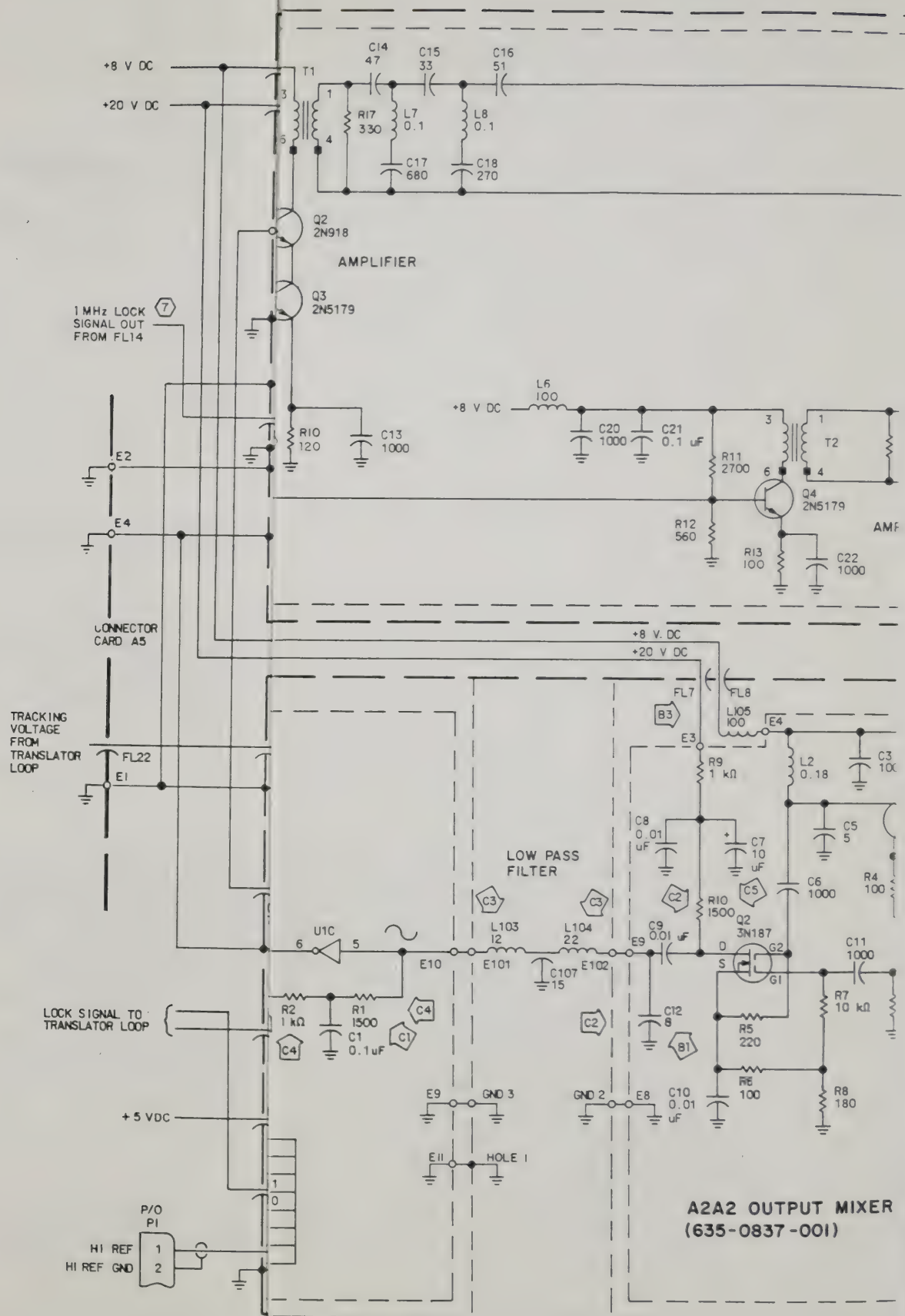
U NO.	TYPE	POWER		
		+5 V (A)	+5 V (B)	GND
U1	N74LS04N		14	1, 3, 7, 9, 11
U2	SN74LS90N		5	2, 3, 6, 7, 10
U3	SN74LS74N	1, 13, 14		2, 7, 12
U4	N74LS00N	14		7
U5	SN74LS74N	1, 4, 10, 13, 14		7

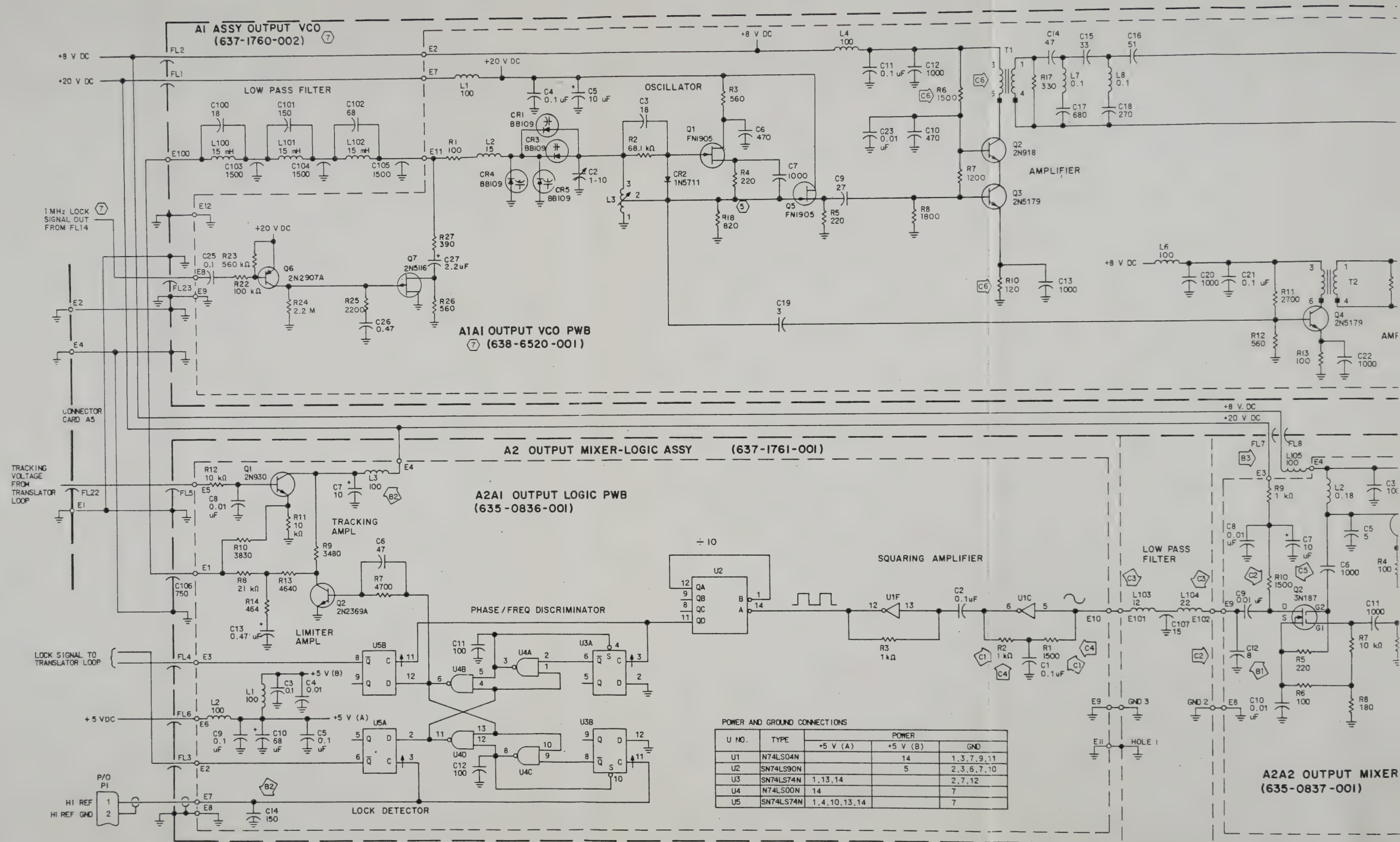


635-0426 SH 3

Synthesizer Output (635-4930-002 only), Schematic Diagram
Figure 9 (Sheet 6)









Rockwell
International

instructions

Collins Telecommunications Products Division

523-0767956-003211
3rd Edition, 1 October 1980

Receive Audio (635-0748-())

Printed in USA

1. DESCRIPTION

Receive Audio 635-0748-001, shown in figure 1, is a 2-layer planar card with a 56-pin edge-on connector (2 layers, 28 pins each).

The receive audio card consists of audio input switching circuits, channel A line audio amplifier, channel B line audio amplifier, headphone audio amplifier, speaker audio amplifier, and squelch control circuits.

2. PRINCIPLES OF OPERATION

2.1 General

The receive audio card receives audio inputs from AM audio, FM audio, SSB audio, ISB audio, or sidetone audio circuits. These inputs are switched to common line audio amplifiers and supplied through output audio circuits to other audio circuits, speakers, headphones, and performance monitors.

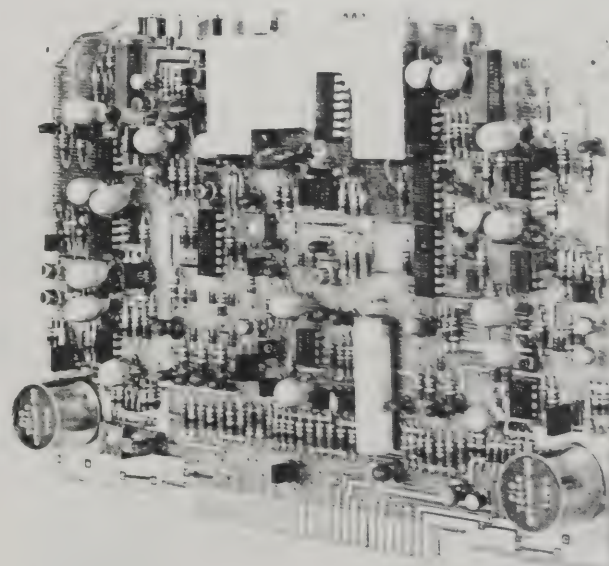
The receive audio card also receives a level controlled speaker audio input and supplies a squelch/mute controlled speaker audio output.

2.2 Audio Input Switching (Refer to figure 2.)

Since the audio input switching circuits are identical for all modes, the following discussion centers on the AM af (audio) input switching.

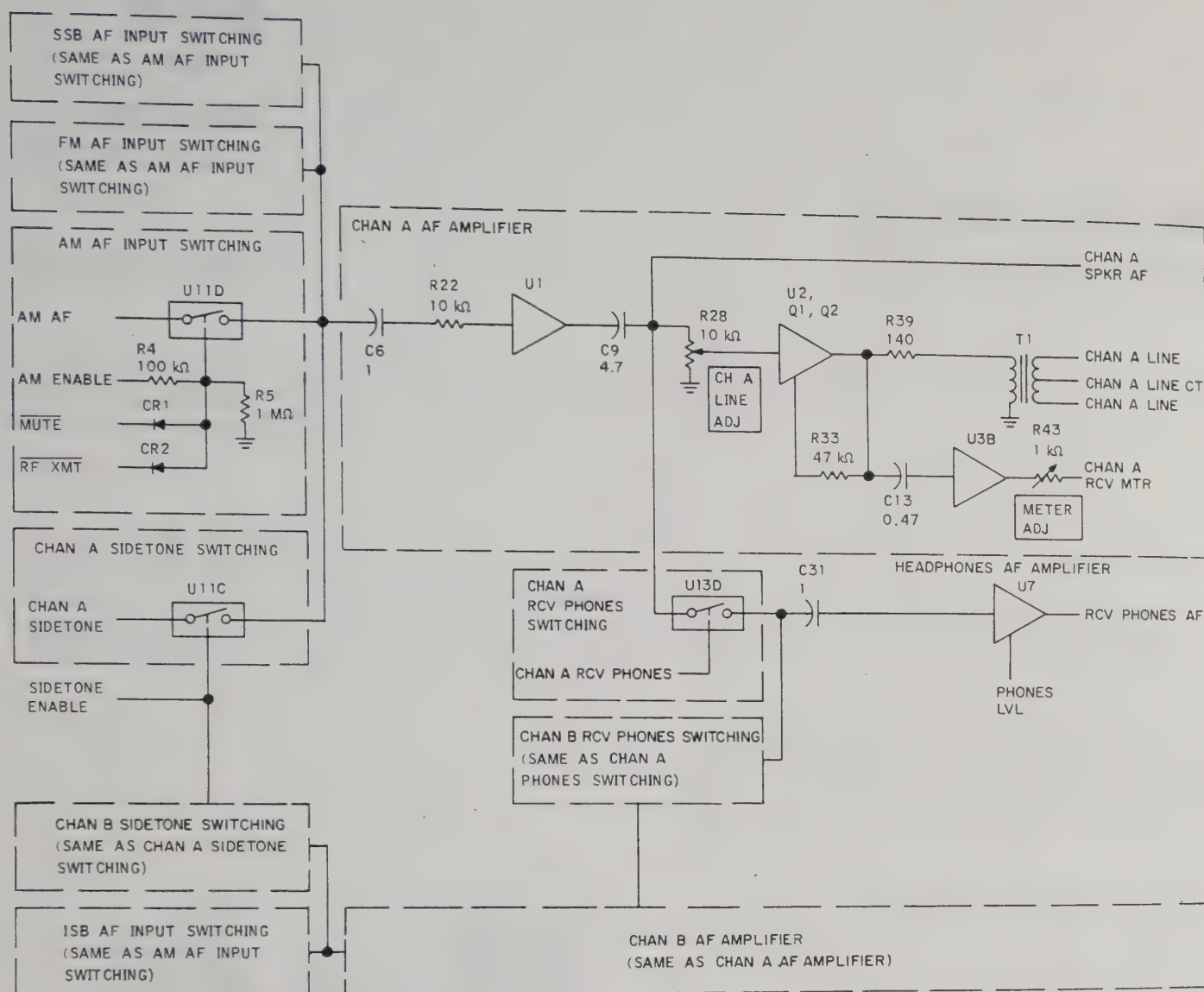
With an AM audio signal and an AM enable signal applied to bilateral switch U11D, AM audio is supplied through closed switch U11D to the input of

the channel A audio amplifier. With a mute or rf xmt signal applied, the AM enable signal is removed. Switch U11D cannot be closed, and the AM audio signal is muted from the input of the channel A audio amplifier.



TP5-2342-017

Receive Audio
Figure 1



TP4-9028-013

Audio Input Switching and Associated Amplifiers
Figure 2

With a channel A sidetone signal and a sidetone enable signal applied to bilateral switch U11C, sidetone is applied through closed switch U11C to the input of the channel A audio amplifier. Note that sidetone and a sidetone enable signal are supplied only during transmit; thus the rf xmt signal is applied to all other audio input switching circuits and mutes these other audio signals.

2.3 Line Audio Amplifiers (Refer to figure 2.)

The line audio amplifiers consist of a channel A audio amplifier and a channel B audio amplifier. These two

line audio amplifiers are identical in operation; thus the following paragraphs discuss only the channel A audio amplifier.

An audio input to the channel A audio amplifier is amplified by U1 and supplied as three audio outputs: input to the speaker audio amplifier, input to the headphones audio amplifier, and input to the channel A line audio amplifier.

The input to the channel A line audio amplifier is level controlled by the CH A LINE ADJ potentiometer and amplified by amplifiers U2, Q1, and Q2. The output of these amplifiers is supplied to performance monitor U3B and audio output transformer

T1. Audio output transformer T1 provides a balanced 600-ohm audio output for external use. U3B provides an adjustable (METER ADJ potentiometer) dc level output to the channel A receive level meter to allow constant monitoring of the channel A audio output level.

2.4 Headphones Audio Amplifier (Refer to figure 2.)

With an audio signal from the channel A input audio amplifier and a channel A receive phones enable signal applied, audio is supplied through closed bilateral switch U13D to headphones amplifier U7. The output of U7 is level controlled externally and supplies audio for an external headphone set.

The channel B headphone audio circuit is identical to the channel A circuit.

2.5 Speaker Audio Amplifier (Refer to figure 3.)

With a speaker audio input signal applied to transistor switch Q9 and the squelch signal removed from Q9, audio is supplied through a closed switch to speaker amplifier U8.

When a squelch signal is applied to Q9, Q9 is opened and speaker audio is squelched.

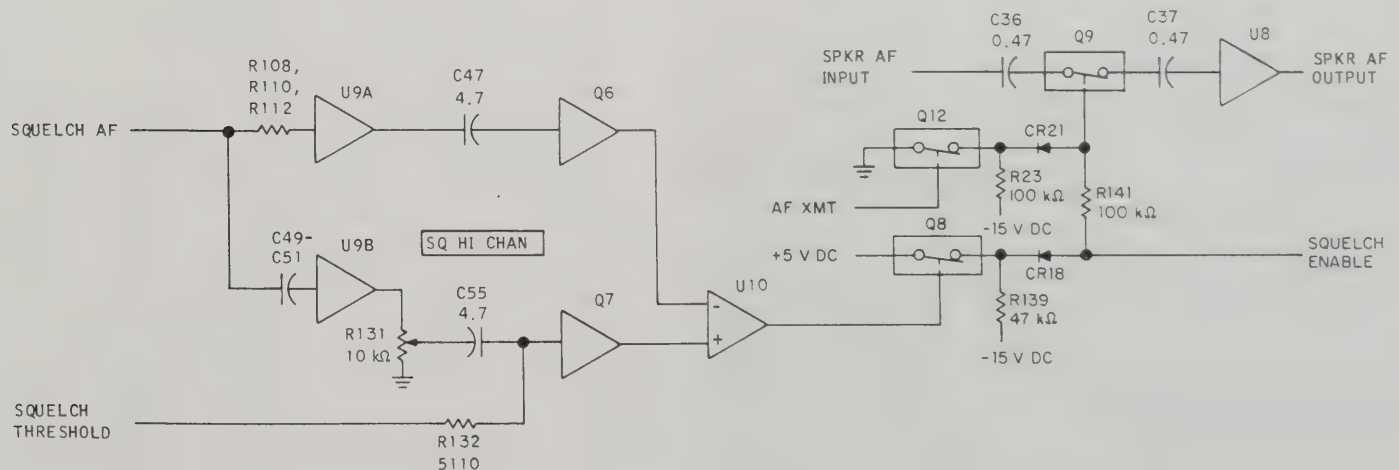
A speaker squelch signal can be applied from one of three sources; squelch enable input, af xmt input, or squelch control circuit.

2.6 Squelch Control Circuit (Refer to figure 3.)

Squelch audio (or noise) signals are supplied at squelch low channel input amplifier U9A and squelch high channel input amplifier U9B. The squelch low-channel signal is level detected by Q6 and applied to the inverting input of U10. The squelch high channel signal is level detected by R131 and Q7 and applied to the noninverting input of U10. When the output of Q7 is lower than the output of Q6, a negative signal is applied from U10 to Q8. Q8 is closed and the squelch signal is removed from Q9. When the output of Q7 exceeds the output of Q6, a positive signal is applied from U10 to Q8. Q8 is opened and the squelch signal is applied to Q9 (noise only or squelched audio condition).

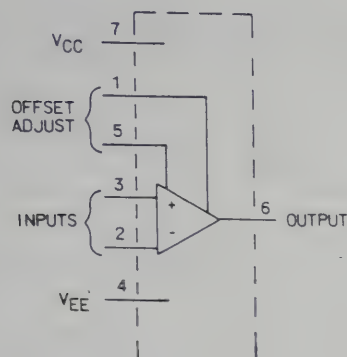
2.7 Operational Amplifier 351-1110-020 (Refer to figure 4.)

The 351-1110-020 is an operational amplifier designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.



Speaker Amplifier and Squelch Control Circuit
Figure 3

TP4-9027-013



CHARACTERISTICS

SUPPLY VOLTAGE: $V_{CC} +22 \text{ V DC MAX}$
 $V_{EE} -22 \text{ V DC MAX}$
 INPUT DIFF VOLTAGE: $\pm 30 \text{ V MAX}$
 INPUT COMMON MODE VOLTAGE:
 $\pm 15 \text{ V MAX}$ (1)
 OUTPUT SHORT CIRCUIT DURATION:
 CONTINUOUS (2)
 INPUT RESISTANCE: $300 \text{ k}\Omega \text{ MIN, } 2.0 \text{ M}\Omega \text{ MAX}$
 OUTPUT RESISTANCE: $75\Omega \text{ TYPICAL}$
 VOLTAGE GAIN: 25 MIN

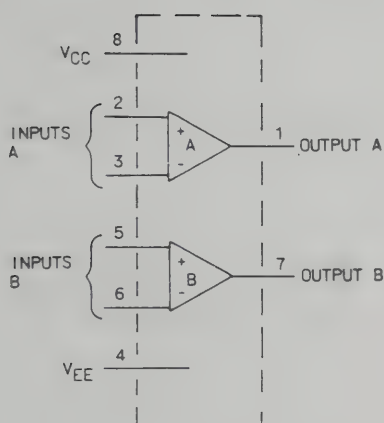
NOTES:

- (1) FOR SUPPLY VOLTAGE LESS THAN $\pm 15.0 \text{ V}$, MAX INPUT VOLTAGE EQUAL TO SUPPLY VOLTAGE.
 (2) SUPPLY VOLTAGE EQUAL TO OR LESS THAN 15 V .

TP5-2286-013

Operational Amplifier 351-1110-020

Figure 4



CHARACTERISTICS

SUPPLY VOLTAGE: $V_{CC} +18 \text{ V DC MAX}$
 $V_{EE} -18 \text{ V DC MAX}$
 INPUT DIFF VOLTAGE: $\pm 30 \text{ V MAX}$
 INPUT COMMON MODE VOLTAGE:
 $\pm 15 \text{ V MAX}$ (1)
 OUTPUT SHORT CIRCUIT DURATION:
 CONTINUOUS (2)
 INPUT RESISTANCE: $300 \text{ k}\Omega \text{ MIN, } 2.0 \text{ M}\Omega \text{ MAX}$
 OUTPUT RESISTANCE: $75\Omega \text{ TYPICAL}$
 VOLTAGE GAIN: 15 MIN

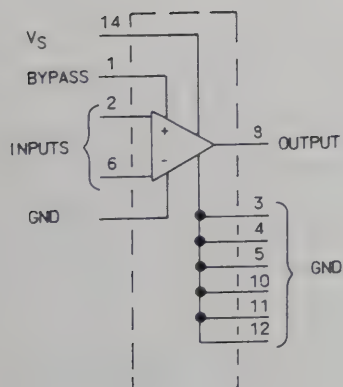
NOTES:

- (1) FOR SUPPLY VOLTAGE LESS THAN $\pm 15.0 \text{ V}$, MAX INPUT VOLTAGE EQUAL TO SUPPLY VOLTAGE.
 (2) SUPPLY VOLTAGE EQUAL TO OR LESS THAN 15 V .

TP5-2285-013

Dual Operational Amplifier 351-1071-070

Figure 5



CHARACTERISTICS

SUPPLY VOLTAGE: $+22 \text{ V DC MAX}$
 INPUT DIFF VOLTAGE: $\pm 0.5 \text{ V MAX}$
 BANDWIDTH: 100 kHz TYPICAL
 INPUT RESISTANCE: $150 \text{ k}\Omega \text{ TYPICAL}$
 OUTPUT RESISTANCE: $8\Omega \text{ TYPICAL}$
 VOLTAGE GAIN: $40 \text{ MIN, } 60 \text{ MAX}$
 OUTPUT VOLTAGE SWING: 14 V p-p TYPICAL
 OUTPUT POWER: 2.5 W MIN

TP5-2284-013

Audio Power Amplifier 351-1118-010

Figure 6

2.8 Dual Operational Amplifier 351-1071-070 (Refer to figure 5.)

The 351-1071-070 consists of two operational amplifiers in one package designed for use as summing amplifiers, integrators, or amplifiers with operating characteristics as a function of the external feedback components.

2.9 Audio Power Amplifier 351-1118-010 (Refer to figure 6.)

The 351-1118-010 is an audio power amplifier with an internal fixed gain of 34 dB.

2.10 COS/MOS Quad Bilateral Switch 351-8252-010 (Refer to figure 7.)

The 351-8252-010 consists of four bilateral switches in one package. The 351-8252-010 bilateral switches exhibit a low closed-switch impedance (60 to 360 Ω typical) and relative constant impedance ($\pm 5 \Omega$) over the full input signal range.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the receive audio card are

listed in the maintenance section of this instruction book.

3.2 Testing

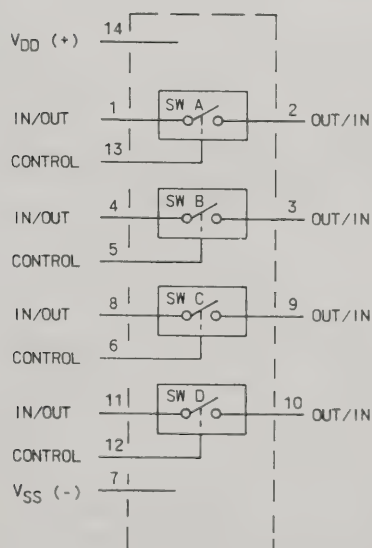
The test procedures in table 1 check the total performance of the receive audio card. These test procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic to circuit trace the fault.

4. ALIGNMENT/ADJUSTMENT

4.1 Channel A Receive Line Amplifier Adjustment

Adjustment of CH A RCV LINE ADJ (R28) is as follows:

- Perform test setup of table 1, test 1.
- Set front-panel MODE switch to AM.
- Connect an audio oscillator to P1-35.
- Set the audio oscillator to 1000 Hz at 10-mV rms output.
- Connect a 600- Ω load across CH A AUD OUT terminals.
- Connect an audio voltmeter across 600- Ω load.
- Adjust CH A LINE ADJ (R28) for a 0-dB mW (+775-mV rms) reading on audio voltmeter.



TYPICAL CHARACTERISTICS

V _{DD} TO V _{SS} VOLTS	CONTROL VOLTS	CLOSED-SWITCH IMPEDANCE		TYPICAL OPEN- SWITCH IMPEDANCE
		TYPICAL	MAX	
15	15	60-145 Ω	220-320 Ω	10 k Ω
10	10	89-190 Ω	400-550 Ω	10 k Ω
5	5	160-360 Ω	3000-5500 Ω	10 k Ω

NOTE: CONTROL VOLTAGE MUST EQUAL V_{DD} TO CLOSE SWITCH.
CONTROL VOLTAGE MUST EQUAL V_{SS} TO OPEN SWITCH.

TP5-2283-013

COS/MOS Quad Bilateral Switch 351-8252-010
Figure 7

Table 1. Receive Audio, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Setup	a. Remove top cover of unit containing the receive audio that is to be tested. b. Remove receive audio card. Install it on an extender card and place it in the unit. c. Set unit LINE SELECTOR switch to 115 V. d. Connect unit to 115-V ac power source and set power on. e. Measure dc voltages between the following pins and ground (TP1, brown): P1-23 P1-27 P1-6 P1-18	+15 $\pm$ 1.0 V dc. +5 $\pm$ 0.5 V dc. -15 $\pm$ 1.0 V dc. +18 $\pm$ 1.0 V dc.	Check associated power supply.
2. Channel A, line amplifier gain	a. Set front-panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Adjust audio oscillator for 1000 Hz at 10 mV rms. d. Connect a 600- Ω load across CH A AUD OUT terminals. e. Connect an oscilloscope across the 600- Ω load. f. Adjust R28 for maximum output with no visible distortion. g. Connect audio voltmeter across 600- Ω load. Note output level. h. Adjust R28 for +10-dB mW output. i. Set front-panel MODE switch to SSB/CW. j. Connect the audio oscillator to P1-34. k. Set audio oscillator for 1000 Hz at 10 mV rms. l. Note output level.	NLT +15 dB mW. Reference. +10 $\pm$ 1 dB mW.	Check Q1, Q2, U1, U2, and associated circuits. If too high check U11D and associated circuit. If too low check U11A and associated circuit.
(Cont)	Note Steps m thru p are applicable only if receiver has FM MODE switch position.		

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	m. Connect the audio oscillator to P1-7. n. Set front-panel MODE switch to FM. o. Set audio oscillator for 1000 Hz at 10 mV rms. p. Note output level. q. Connect an 800-Ω load between P1-5 and ground. r. Connect the audio oscillator to P1-5. s. Apply +5-V dc signal to P1-38. t. Set audio oscillator for 1000 Hz at 10 mV rms. u. Note output level. v. Remove +5 V dc from P1-38. w. Set front-panel MODE switch to AM. x. Connect the audio oscillator to P1-35. y. Adjust audio oscillator for 1000 Hz at 10 mV rms. z. Adjust R28 for 0-dB mW output level.	+10 $\pm$1 dB mW. +10 $\pm$1 dB mW.	Check U11B and associated circuit. Check U11C and associated circuit.
3. Channel A, frequency response	a. Set front-panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Connect a 600-Ω load across CH A AUD OUT terminals. d. Connect an audio voltmeter across 600-Ω load. e. Adjust audio oscillator from 0 to 10 000 Hz with a constant 10-mV rms output. f. Note maximum level and frequencies at point 1 dB below maximum level.	Upper 1 dB frequency NLT 8000 Hz, NMT 12 kHz. Lower 1 dB frequency, NMT 250 Hz.	Check Q1, Q2, U1, U2, and associated circuits.
4. Channel A, total harmonic distortion (Cont)	a. Set front-panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Connect a 600-Ω load across CH A AUD OUT terminals.		

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. (Cont)	d. Connect distortion analyzer across 600- Ω load. e. Adjust audio oscillator to 300 Hz at 10-mV rms output. f. Measure total harmonic distortion using distortion analyzer. g. Repeat step f with audio oscillator set at: 1000 Hz 6000 Hz	NMT 3%. NMT 0.5%. NMT 0.5%.	Check bypass and dc blocking capacitors. } Same as step f.
5. Channel B, line amplifier gain (with ISB only)	a. Set front-panel MODE switch to ISB. b. Connect an audio oscillator to P1-50. c. Adjust audio oscillator for 1000 Hz at 10 mV rms. d. Connect a 600- Ω load across CH B AUD OUT terminals. e. Connect an oscilloscope across the 600- Ω load. f. Adjust R65 for maximum output with no visible distortion. g. Note output level. h. Adjust R65 for +10-dB mW output. i. Connect an 800- Ω load between P1-22 and ground. j. Connect the audio oscillator to P1-22. k. Apply +5-V dc signal to P1-38. l. Set audio oscillator for 1000 Hz at 10 mV rms. m. Note output level. n. Remove +5 V dc from P1-38. o. Connect the audio oscillator to P1-50.	NLT 15 dB mW. +10 $\pm$ 1 dB mW.	Check Q4, Q5, U4, U5, and associated circuits. If too high check U12B and associated circuits. If too low check U12C and associated circuits.
(Cont)			

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5. (Cont)	p. Adjust audio oscillator for 1000 Hz at 10 mV rms. q. Adjust R65 for 0-dB mW output level.		
6. Channel B, frequency response (with ISB only)	a. Set front-panel MODE switch to ISB. b. Connect an audio oscillator to P1-50. c. Connect a 600-Ω load across CH B AUD OUT terminals. d. Connect an audio voltmeter across 600-Ω load. e. Adjust audio oscillator from 0 to 10 000 Hz with a constant 10-mV rms output. f. Note maximum level and frequencies at point 1 dB below maximum level.	Upper 1 dB frequency NLT 8000 Hz, NMT 12 kHz. Lower 1 dB frequency, NMT 250 Hz.	Check Q4, Q5, U4, U5, and associated circuit.
7. Channel B, total harmonic distortion (with ISB only)	a. Set front-panel MODE switch to ISB. b. Connect an audio oscillator to P1-50. c. Connect a 600-Ω load across CH B AUD OUT terminals. d. Connect a distortion analyzer across 600-Ω load. e. Adjust audio oscillator to 300 Hz at 10-mV rms output. f. Measure total harmonic distortion using distortion analyzer. g. Repeat step f with audio oscillator set at: 1000 Hz 6000 Hz	NMT 3%. NMT 0.5%. NMT 0.5%.	Check bypass and dc blocking capacitors. } Same as step f.
8. Headphone amplifier, gain	a. Set front-panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Connect a distortion analyzer to P1-12. d. Adjust audio oscillator to 1000 Hz at 10-mV rms output. e. Set front panel PHONES level control to minimum.		
(Cont)			

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8. (Cont)	f. Set front-panel PHONES switch to CH A. g. Note that a negligible audio output is present on the audio voltmeter. h. Set front-panel PHONES level control to maximum. i. Note level on the audio voltmeter. Note Steps 8.j through 8.n with ISB only. j. Set front-panel MODE switch to ISB. k. Connect the audio oscillator to P1-50. l. Adjust audio oscillator to 1000 Hz at 10-mV rms output. m. Set front-panel PHONES switch to CH B. n. Note level on the audio voltmeter.	NLT 30 dB below level of step i. NLT +15 dB mW. NLT +15 dB mW.	Check U13D, U7, and associated circuits. Check U13B and associated circuits.
9. Headphone amplifier, frequency response	a. Set front-panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Connect an audio voltmeter to P1-12. d. Set front-panel PHONES level control to midrange. e. Set front-panel PHONES switch to CH A. f. Adjust audio oscillator from 0 to 10 000 Hz with a constant 10-mV rms output. g. Note maximum output level and frequencies at point 1 dB below maximum level.	Upper 1-dB frequency NLT 6000 Hz. Lower 1-dB frequency, NLT 250 Hz.	Check U7 and associated circuits.
10. Headphone amplifier, total harmonic distortion (Cont)	a. Set front-panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Connect a distortion analyzer to P1-12. d. Set front-panel PHONES switch to CH A. e. Adjust audio oscillator to 1000 Hz at 10-mV rms output.		

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10. (Cont)	f. Adjust front-panel PHONES level control for 0 ± 1 dB mW at P1-12. g. Measure total harmonic distortion using distortion analyzer.	NMT 0.5%.	Check bypass and dc blocking capacitors.
11. Speaker amplifier, gain	a. Set front-panel MODE switch to AM. b. Set front-panel SPKR switch to CH A. c. Connect an audio oscillator to P1-35. d. Connect an audio voltmeter between P1-19 and P1-17. e. Adjust audio oscillator to 1000 Hz at 10-mV rms output. f. Set SQUELCH control to off (fully ccw). g. Increase front-panel AF GAIN control until distortion analyzer indicates 4 V rms. h. Measure distortion using the distortion analyzer. Note Steps 11.i through 11.m with ISB only. i. Set front-panel MODE switch to ISB. j. Set front-panel SPKR switch to CH B. k. Connect an audio oscillator to P1-50. l. Adjust AF GAIN control until distortion analyzer indicates 4 V rms. m. Measure distortion using the distortion analyzer.	NMT 3%.	Check U8 and associated circuits.
12. Speaker amplifier, frequency response	a. Set front-panel MODE switch to AM. b. Set front-panel SPKR switch to CH A. c. Connect an audio oscillator to P1-35. d. Connect an audio voltmeter between P1-19 and P1-17. e. Set SQUELCH control to off (fully ccw). f. Adjust audio oscillator to 1000 Hz at 10-mV rms output. g. Adjust AF GAIN control for 0.5 V rms as indicated on audio voltmeter. h. Adjust audio oscillator from 0 to 10 000 Hz.		
(Cont)			

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
12. (Cont)	i. Note maximum output level and frequencies at point 1 dB below maximum level.	Upper 1 dB frequency, NLT 6000 Hz. Lower 1 dB frequency, NMT 250 Hz.	Check Q9, U8, and associated circuit.
13. Speaker amplifier, total harmonic distortion	a. Set front-panel MODE switch to AM. b. Set front-panel SPKR switch to CH A. c. Connect an audio oscillator to P1-35. d. Connect a distortion analyzer between P1-19 and P1-17. e. Set SQUELCH control to off (fully ccw). f. Adjust audio oscillator to 1000 Hz at 10-mV rms outputs. g. Adjust front-panel AF GAIN control until distortion analyzer indicates 4 V rms. h. Measure total harmonic distortion using distortion analyzer.	NMT 3%.	Check bypass and dc blocking capacitors.
14. Squelch (Cont)	a. Set front-panel MODE switch to AM. b. Set front-panel SPKR switch to CH A. c. Connect audio oscillator to P1-35. d. Connect an audio voltmeter between P1-19 and P1-17. e. Set front-panel SQUELCH control on (away from fully ccw). f. Adjust the squelch threshold for minimum resistance (SQUELCH control near full ccw). g. Set audio oscillator to 500 Hz at 10-mV rms output. h. Set AF GAIN control for 0.5 V rms as indicated by audio voltmeter. i. Slowly increase audio oscillator frequency until audio output is squelched. Note frequency.	Between 600 and 2500 Hz.	If too low, check Q7, U9B, and associated circuit. If too high, check Q6, U9A, and associated circuit.

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
14. (Cont)	j. Return audio oscillator to 500 Hz and note that audio output returns. k. Quickly switch from 500 to 3000 Hz audio and note time required for audio to squelch.	NMT 3 seconds.	Check Q7, U9B, U10, Q8, and associated circuit.
15. Channel A, performance monitor	a. Set front-panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Connect a dvm to P1-2. d. Set audio oscillator to 1000 Hz at 10-mV rms output. e. Note dvm reading. f. Decrease audio oscillator output by 10 dB. g. Note dvm reading.	NMT 0.5 V dc. NLT +3.0 V dc.	Check U3A, Q10, and associated circuits. Same as step e.
16. Channel B, performance monitor (with ISB only)	a. Set front-panel MODE switch to ISB. b. Connect an audio oscillator to P1-50. c. Connect a dvm to P1-51. d. Set audio oscillator to 1000 Hz at 10-mV rms output e. Note dvm reading. f. Decrease audio oscillator output by 10 dB. g. Note dvm reading.	NMT 0.5 V dc. NLT +3.0 V dc.	Check U6B, Q11, and associated circuits. Same as step e.
17. Channel A receive meter (Cont)	a. Set front panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Connect a 600- Ω load between CH A AUD OUT terminals. d. Set front-panel METER switch to CH A AF (+3FS). e. Set audio oscillator to 1000 Hz at 10-mV rms output. f. Note front-panel meter reading.	$\cong 0$ dB mW.	Adjust per paragraph 4.3. Check U3B and associated circuit.

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
17. (Cont)	g. Decrease audio oscillator output by 10 dB. h. Note front-panel meter reading.	$\cong -10$ dB mW.	Same as step e.
18. Channel B, receive meter (with ISB only)	a. Set front-panel MODE switch to ISB. b. Connect an audio oscillator to P1-50. c. Connect a 600-Ω load between CH B AUD OUT terminals. d. Set front-panel METER switch to CH B AF (+3FS). e. Set audio oscillator to 1000 Hz at 10-mV rms output. f. Note front-panel meter reading. g. Decrease audio oscillator output by 10 dB. h. Note front-panel meter reading.	$\cong 0$ dB mW. $\cong -10$ dB mW.	Adjust per paragraph 4.4. Check U6A and associated circuit. Same as step e.
19. Rf transmit	a. Set front-panel MODE switch to AM. b. Connect an audio oscillator to P1-35. c. Set front-panel METER switch to CH A AF (+3FS). d. Set audio oscillator to 1000 Hz at 10-mV rms output. e. Reference front-panel meter reading. f. Apply a +5-V dc signal at P1-41. g. Note front-panel meter reading. h. Remove +5 V dc from P1-41. i. Note front-panel meter reading. j. Set front-panel MODE switch to SSB/CW (receiver) or USB (receiver-exciter). k. Remove audio oscillator from P1-35 and connect it to P1-34 (same 10-mV output).	Reference. No deflection. Step e reference.	Check Q3, CR2, U11D, and associated circuit.
(Cont)	l. Reference front-panel meter reading.	Reference.	

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont.).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
19. (Cont)	m. Apply a +5-V dc signal at P1-41. n. Note front-panel meter reading. o. Remove +5 V dc from P1-41. p. Note front-panel meter reading. q. Apply +5-V dc signal at P1-10. r. Remove audio oscillator from P1-34 and connect it to P1-7 (same 10-mV output). s. Reference front-panel meter reading. t. Apply a +5-V dc signal at P1-41. u. Note front-panel meter reading. v. Remove +5 V dc from P1-41. w. Note front-panel meter reading. x. Remove +5 V dc from P1-10. y. Apply +5 V dc from P1-38. z. Remove audio oscillator from P1-7 and connect it to P1-5 (same 10-mV output). aa. Reference front-panel meter reading. ab. Apply a +5-V dc signal at P1-41. ac. Note front-panel meter reading. ad. Remove +5 V dc from P1-41. ae. Note front-panel meter reading. af. Remove +5 V dc from P1-38. Note Steps 19.ag through 19.at with ISB only. ag. Set front-panel MODE switch to ISB. ah. Remove audio oscillator from P1-5 and connect it to P1-50 (same 10-mV output). ai. Reference front-panel meter reading. aj. Apply a +5-V dc signal at P1-41.	No deflection. Step l reference. Reference. No deflection. Step s reference. Reference. Step aa reference. Step aa reference. Reference.	Check CR4, U11A, and associated circuit. Check CR6, U11B, and associated circuit. Check for shorts or unauthorized modification.
(Cont)			

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

[illegible]

Table 1. Receive Audio, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
20. (Cont)	ao. Remove audio oscillator from P1-50 and connect it to P1-22 (same 10-mV output). ap. Reference front-panel meter reading. aq. Apply a ground signal at P1-13. ar. Note front-panel meter reading. as. Remove ground from P1-13. at. Note front-panel meter reading.	Reference. Step ap reference. Step ap reference.	Check for shorts or unauthorized modifications.
21. Af transmit	a. Set front-panel MODE switch to AM. b. Set front-panel SPKR switch to CH A. c. Connect an audio oscillator to P1-35. d. Connect an audio voltmeter between P1-19 and P1-17. e. Adjust audio oscillator to 1000 Hz at 10-mV rms output. f. Set SQUELCH control to off (fully ccw). g. Adjust front-panel AF GAIN control until audio voltmeter indicates 0.5 V rms. h. Apply +5-V dc signal to P1-4. i. Note audio voltmeter reading. j. Remove +5 V dc from P1-4. k. Note audio voltmeter reading.	0.0 V rms. 0.5 V rms.	Check Q12, Q9, CR21, and associated circuit. Same as step i.

4.2 Channel B Receive Line Amplifier Adjustment

Adjustment of CH B RCV LINE ADJ (R65) is as follows:

- Perform test setup of table 1, test 1.
- Set front-panel MODE switch to ISB.
- Connect an audio oscillator to P1-50.
- Set the audio oscillator to 1000 Hz at 10-mV rms output.
- Connect a 600- Ω load across CH B AUD OUT terminals.
- Connect an audio voltmeter across 600- Ω load.
- Adjust CH B LINE ADJ (R65) for a 0-dB mW (+775-mV rms) reading on audio voltmeter.

4.3 Channel A Meter Adjustment

Adjustment of METER ADJ (R43) is as follows:

- Perform channel A line amplifier adjustment per paragraph 4.1.
- Perform test setup of table 1, test 1.
- Set front-panel MODE switch to AM.
- Connect an audio oscillator to P1-35.
- Set front-panel METER switch to RCV-CH A AF (+3FS).
- Set the audio oscillator to 1000 Hz at 10-mV rms output.
- Adjust METER ADJ (R43) for a 0-dB mW reading on the front-panel meter.

4.4 Channel B Meter Adjustment

Adjustment of METER ADJ (R80) is as follows:

- Perform channel B line amplifier adjustment per paragraph 4.2.
- Perform test setup of table 1, test 1.
- Set front-panel MODE switch to ISB.
- Connect an audio oscillator to P1-50.
- Set the audio oscillator to 1000 Hz at 10-mV rms output.
- Set front-panel METER switch to RCV-CH B AF (+3FS).
- Adjust METER ADJ (R80) for a 0-dB mW reading on the front-panel meter.

4.5 Squelch Adjustment

Perform squelch high-channel adjust (R131) as follows:

- Perform test setup of table 1, test 1.
- Set front-panel MODE switch to AM.
- Set front-panel SPKR switch to CH A.
- Connect an audio oscillator to P1-35.

- Connect audio voltmeter to TP5 (green), voltmeter common to TP1 (brown).
- Adjust audio oscillator (10-mV rms output) from 0 through 10 000 Hz and note maximum indication on audio voltmeter (frequency should be 600 ± 100 Hz). Note amplitude.
- Connect audio voltmeter to TP4 (yellow), voltmeter common to TP1 (brown).
- Adjust audio oscillator (10-mV rms output) from 0 through 10 000 Hz and note maximum indication on audio voltmeter (frequency should be 2400 ± 400 Hz).
- Set audio oscillator to frequency (10-mV rms output) that gave the maximum indication in step h.
- Adjust R131 to produce a level at TP4 (yellow), 12 dB below the amplitude noted in step f.

5. REPAIR

Repair of the receive audio card is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

6. PARTS LIST/DIAGRAMS

6.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 8). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

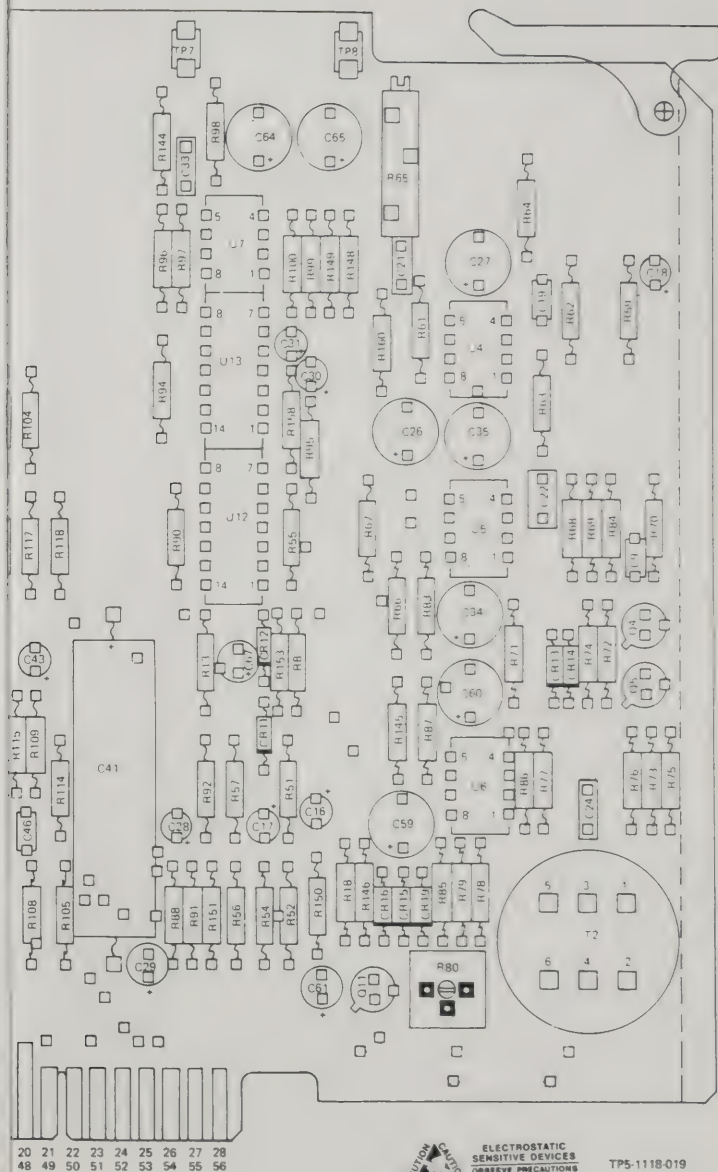
CODE	MANUFACTURER'S NAME AND ADDRESS
00872	TELEDYNE SYSTEMS CO MICROELECTRONICS DIV 12964 PANAMA ST LOS ANGELES CA 90066
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021

CODE	MANUFACTURER'S NAME AND ADDRESS
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
12954	SIEMENS CORP COMPONENTS GROUP 8700 E THOMAS RD P O BOX 1390 SCOTTSDALE AZ 85252
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
22229	SOLITRON DEVICES INC SEMICONDUCTOR GROUP SAN DIEGO OPERS 8808 BALBOA AVE SAN DIEGO CA 92123
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
73386	FREED TRANSFORMER CO INC 1736 WEIRFIELD ST BROOKLYN NY 11227
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
80294	BOURNO INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
98330	POLYPHASE INSTRUMENT CO E FOURTH ST BRIDGEPORT PA 19405

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Receive audio	635-0748-001	REV N
Receive audio	635-0748-002	REV N



Receive Audio, Schematic Diagram
Figure 8 (Sheet 1 of 5)

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

6.2 Parts List

REF DES Column - Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column - Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history.

COLLINS PART NUMBER Column - Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column - Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column - Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column - Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

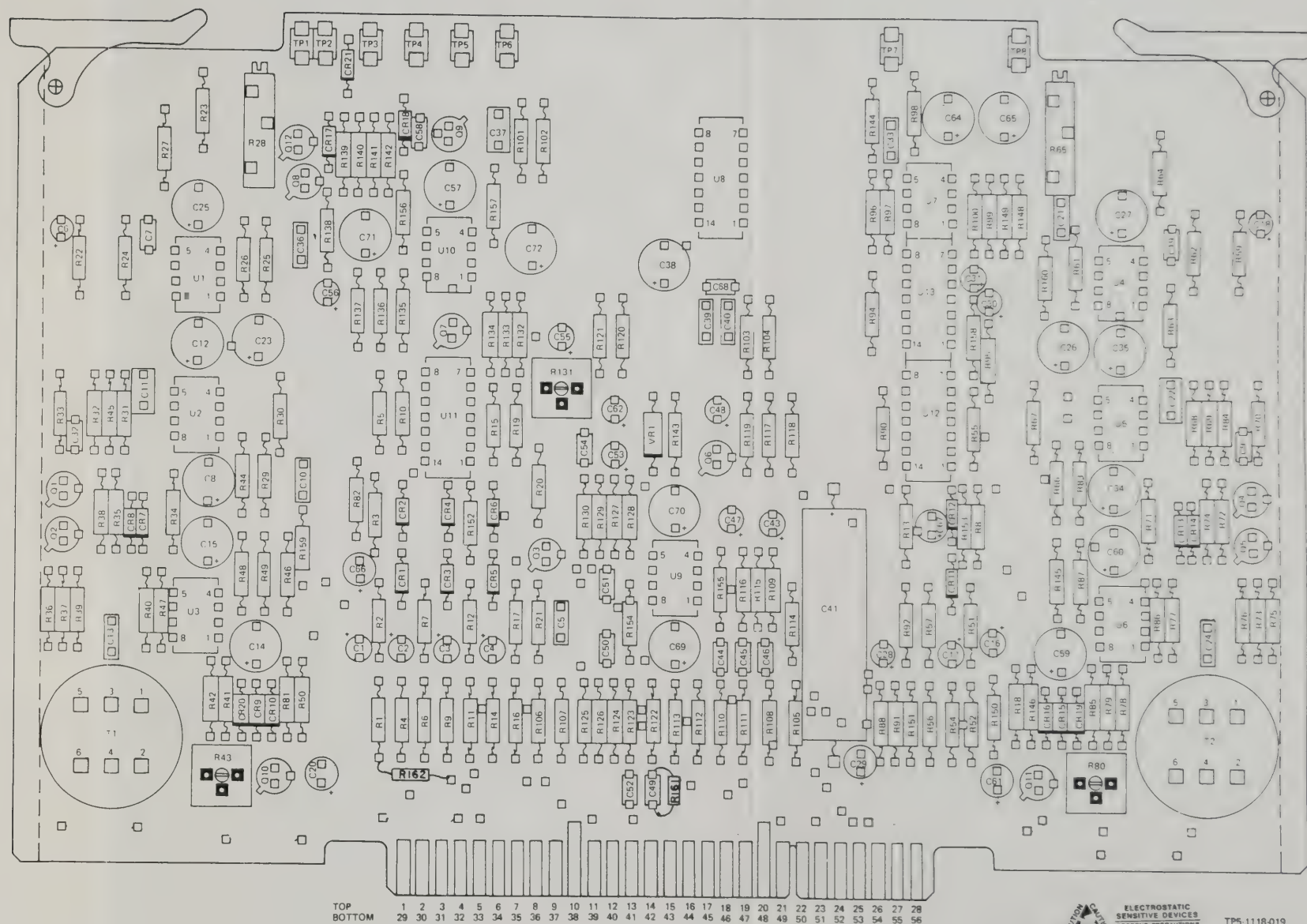
<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
00872	TELEDYNE SYSTEMS CO MICROELECTRONICS DIV 12964 PANAMA ST LOS ANGELES CA 90066
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
12954	SIEMENS CORP COMPONENTS GROUP 8700 E THOMAS RD P O BOX 1390 SCOTTSDALE AZ 85252
16546	GLOBE-UNION INC USCC/CENTRALAB ELECTRICS DIV 4561 COLORADO LOS ANGELES CA 90039
22229	SOLITRON DEVICES INC SEMICONDUCTOR GROUP SAN DIEGO OPERS 8808 BALBOA AVE SAN DIEGO CA 92123
27014	NATIONAL SEMICONDUCTOR CORP 2900 SEMICONDUCTOR DR SANTA CLARA CA 95051
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
72136	ELECTRO MOTIVE CORP SUBSIDIARY OF INTERNATIONAL ELECTRONICS CORP LAUTER AVE P O BOX 7600 FLORENCE SC 29501
73386	FREED TRANSFORMER CO INC 1736 WEIRFIELD ST BROOKLYN NY 11227
74970	JOHNSON E F CO 299 10TH AVE S W WASECA MN 56093
80294	BOURNO INC INSTRUMENT DIV 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATION
98330	POLYPHASE INSTRUMENT CO E FOURTH ST BRIDGEPORT PA 19405

6.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Receive audio	635-0748-001	REV N
Receive audio	635-0748-002	REV N



CAUTION
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPS-1118-019

Receive Audio, Schematic Diagram
Figure 8 (Sheet 1 of 5)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR NS CODE	USABLE ON CODE	MFR MFR CODE PART NUMBER
CR1-CR21	RECEIVE AUDIO (ESDS)	635-0748-001 A		791-000		81349 RCR07G153KS
	RECEIVE AUDIO (ESDS)	635-0748-002 B		738-000		81349 RCR07G511JS
	SEMICONDUCTOR DEVICE	353-3644-010	035	800-000		81349 RCR07G273KS
C1-C4	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350	562	749-000		81349 RCR07G102KS
C5	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440	813	800-000		81349 RCR07G273KS
C6	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350	562	738-000		81349 RCR07G511JS
C7	CAPACITOR,FXD CER DIEL, 56PF, 10%, 200V (A2)	913-4003-000	813	789-000		81349 RCR07G133JS
C7	CAPACITOR,FXD CER DIEL, 18PF, PORM10%, 200V (B2)	913-5019-040	813	810-000		81349 RCR07G513JS
C7	CAPACITOR,FXD MICA DIEL, 24PF, PORM 0.5PF, 50V	912-4141-160	721	078-000		81349 RN5505112F
C8	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	812-000		81349 RCR07G563KS
C9	CAPACITOR,FXD CER DIEL, 56PF, 10%, 200V (A2)	913-4003-000	813	080-000		81349 RN5505622F
C9	CAPACITOR,FXD CER DIEL, 47PF, 10%, 200V	913-4002-000	813	068-000		81349 RN5503162F
C10	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V (B1)	913-5019-440	813	605-360		81349 RN5505761F
C10	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350	562	773-000		81349 RCR07G472KS
C11	CAPACITOR,FXD CER DIEL, 1UF, 20%, 50V	913-3279-270	165	845-000		81349 RCR07G474KS
C12	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	821-000		81349 RCR07G104KS
C13	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V (B1)	913-5019-440	813	785-000		81349 RCR07G103KS
C13	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350	562	816-000		81349 RCR07G753JS
C14,C15	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	827-000		81349 RCR07G154KS
C16-C18	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350	562	738-000		81349 RCR07G511JS
C19	CAPACITOR,FXD CER DIEL, 56PF, 10%, 200V (A2)	913-4003-000	813	827-000		81349 RCR07G154KS
C19	CAPACITOR,FXD CER DIEL, 18PF, PORM10%, 200V (B2)	913-5019-040	813	812-000		81349 RCR07G563KS
C19	CAPACITOR,FXD MICA DIEL, 24PF, PORM 0.5PF, 50V	912-4141-160	721	810-000		81349 RN5505622F
C20	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-170	562	078-000		81349 RCR07G513JS
C21	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V (B1)	913-5019-440	813	738-000		81349 RC20BF681J
C21	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350	562	767-000		81349 RCR07G511JS
C22	CAPACITOR,FXD CER DIEL, 1UF, 20%, 50V	913-3279-270	165	767-000		81349 RCR07G332KS
C23	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	038-070		80294 3386P1-103
C24	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V (B1)	913-5019-440	813	030-000		81349 RN5505111F
C24	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350	562	068-000		81349 RN5503162F
C25-C27	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	080-000		81349 RN5505622F
C28	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350	562	063-000		81349 RN5502492F
C29	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-170	562	773-000		81349 RCR07G472KS
C30,C31	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350	562	845-000		81349 RCR07G474KS
C32	CAPACITOR,FXD CER DIEL, 56PF, 10%, 200V (A2)	913-4003-000	813	821-000		81349 RCR07G104KS
C32	CAPACITOR,FXD CER DIEL, 47PF, 10%, 200V	913-4002-000	813	749-000		81349 RCR07G102KS
C33	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440	813	809-000		81349 RCR07G473KS
C34,C35	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	713-000		81349 RCR07G101KS
C36	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440	813	821-000		81349 RCR07G104KS
C37	CAPACITOR,FXD CER DIEL, 0.47UF, 20%, 50V	913-3279-250	165	0857-000		81349 RCR07G105KS
C38	CAPACITOR,FXD ELCTLT, 33UF, 20%, 25V	184-9102-260	562	743-000		81349 RCR07G631KS
C39,C40	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440	813	773-000		81349 RCR07G472KS
C41	CAPACITOR,FXD ELCTLT, 220UF, M10ZP75%, 20V	183-1277-200	562	800-000		81349 RCR07G273KS
C42	NOT USED			815-000		81349 RCR07G683KS
C43	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070	562	821-000		81349 RCR07G104KS
C44	CAPACITOR,FXD CER DIEL, 0.022UF, PORM10%, 50V	913-5019-240	813	779-000		81349 RCR07G682KS
C45,C46	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200	813	749-000		81349 RCR07G102KS
C47,C48	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070	562	833-000		81349 RCR07G224KS
C49	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V (A2)	913-5019-200	813	725-000		81349 RCR07G221KS
C50,C51	CAPACITOR,FXD CER DIEL, 330PF, 10%, 200V	913-4012-000	813	833-000		81349 RCR07G224KS
C52	CAPACITOR,FXD CER DIEL, 680PF, 10%, 200V	913-4016-000	813	821-000		81349 RCR07G104KS
C53	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070	562	785-000		81349 RCR07G103KS
C54	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200	813	803-000		81349 RCR07G333KS
C55,C56	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070	562	0857-000		81349 RCR07G105KS
C57	CAPACITOR,FXD ELCTLT, 33UF, 20%, 25V	184-9102-260	562	410-010 A		73386 41712
C58	CAPACITOR,FXD CER DIEL, 3300PF, PORM10%, 100V	913-5019-140	813	327-010 B		98130 T4465
C59,C60	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	484-070		74970 105-1108-001
C61	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-170	562	484-020		74970 105-1102-001
C62	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070	562	484-050		74970 105-1106-001
C63	NOT USED			484-060		74970 105-1107-001
C64,C65	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	484-040		74970 105-1104-001
C66,C67	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-170	562	484-080		74970 105-1110-001
C68	CAPACITOR,FXD CER DIEL, 100PF, 10%, 200V	913-4006-000	813	484-090		74970 105-1112-001
C69-C72	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190	562	484-100		74970 105-1113-001
Q1	TRANSISTOR	352-0661-020	0726	110-020		07263 UA741TC
Q2	TRANSISTOR	352-0551-010	0471	071-070		04713 MC1458P1
Q3,Q4	TRANSISTOR	352-0661-020	0726	110-020		07263 UA741TC
Q5	TRANSISTOR	352-0551-010	0471	071-070		04713 MC1458P1
Q6,Q7	TRANSISTOR	352-0661-020	0726	118-010		27014 LM380N
Q8	TRANSISTOR	352-0551-010	0471	071-070		04713 MC1458P1
Q9	TRANSISTOR (ESDS)	352-0759-020	0087	110-020		07263 UA741TC
Q10,Q11	TRANSISTOR	352-0661-020	0726	052-010		04713 MC14068BCP
Q12	TRANSISTOR (ESDS)	352-0605-010	2222	0710-000		12954 1N751A
R1	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W	745-0743-000	813			
R2	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000	813			
R3	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000	813			
R4	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000	813			
R5	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000	813			
R6	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W	745-0743-000	813			
R7	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000	813			
R8	RESISTOR,FXD CHPSN, 0.47MEGO, 10%, 1/4W	745-0845-000	813			
R9	RESISTOR,FXD CHPSN, 0.10MEGO, 10%, 1/4W	745-0821-000	813			
R10	RESISTOR,FXD CHPSN, 1MEGO, 10%, 1/4W	745-0857-000	813			
R11	RESISTOR,FXD CHPSN, 680 OHMS, 10%, 1/4W	745-0743-000	813			
R12	RESISTOR,FXD CHPSN, 0.22MEGO, 10%, 1/4W	745-0833-000	813			

Diagram

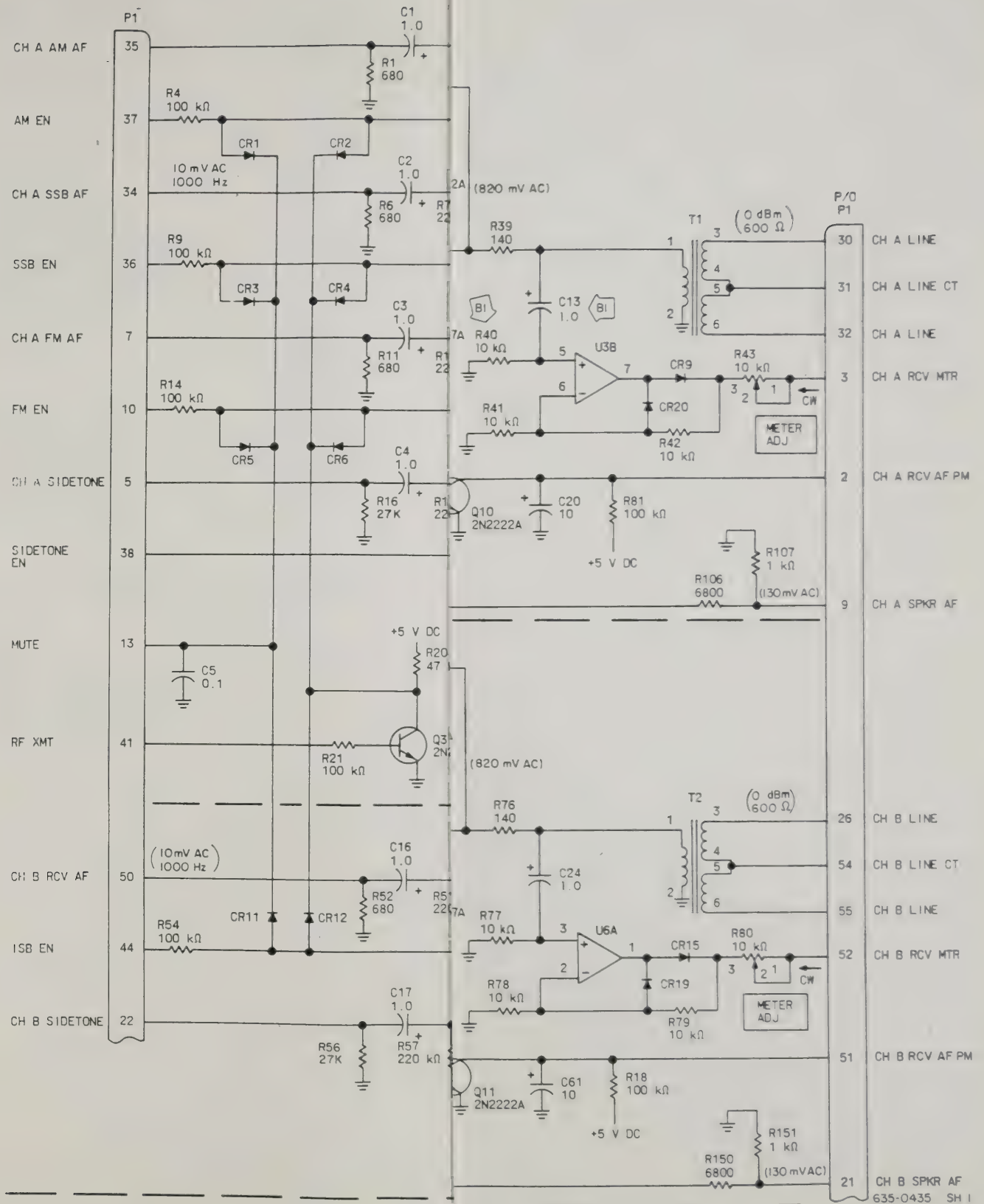
(2)

PARTS LIST

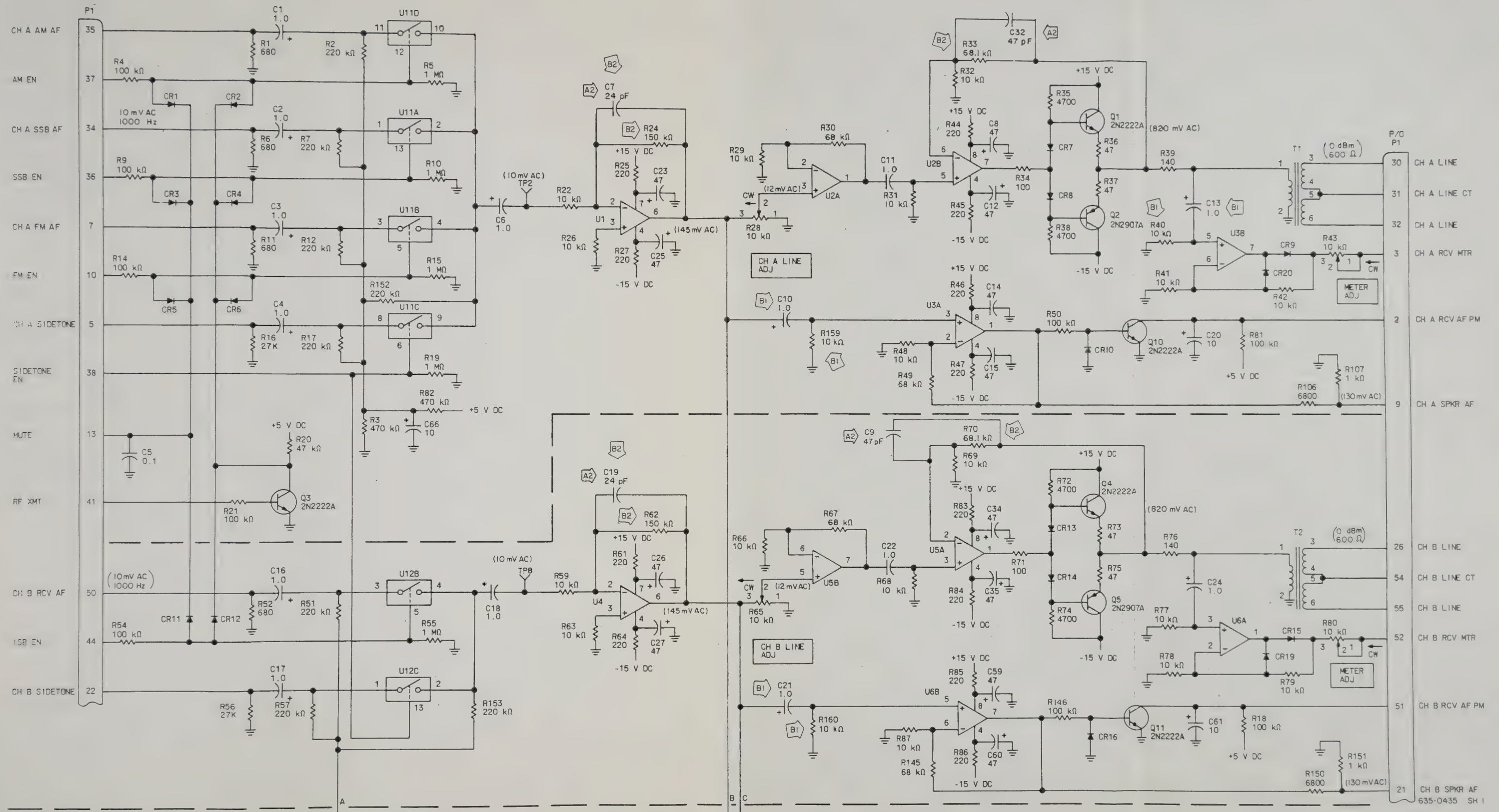
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE DM CODE	MFR CODE	MFR PART NUMBER
CR1-CR21	RECEIVE AUDIO (ESDS)	635-0748-001 A			
	RECEIVE AUDIO (ESDS)	635-0748-002 B			
	SEMICON DEVICE	353-3644-010		03508	1N4544GE
C1-C4	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	56289 199D105X0035BB1			
C5	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C6	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	56289 199D105X0035BB1			
C7	CAPACITOR,FXD CER DIEL, 56PF, 10%, 200V (A2)	913-4003-000		81349	CK05BX560K
C17	CAPACITOR,FXD CER DIEL, 18PF, PORM10%, 200V (B2)	913-5019-040		81349	CK05BX180K
C7	CAPACITOR,FXD MICA DIEL, 24PF, PORM 0.5PF, 50V	912-4141-160		72136	DM5E240D050WV
C8	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
C9	CAPACITOR,FXD CER DIEL, 1UF, 20%, 200V (A2)	913-4003-000		81349	CK05BX560K
C9	CAPACITOR,FXD CER DIEL, 47PF, 10%, 200V	913-4002-000		81349	CK05BX470K
C10	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V (B1)	913-5019-440		81349	CK06BX104K
C10	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C11	CAPACITOR,FXD CER DIEL, 1UF, 20%, 50V	913-3279-270		16546	CY30C105H
C12	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
C13	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V (B1)	913-5019-440		81349	CK06BX104K
C13	CAPACITOR,FXD TMTLM ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C14,C15	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
C16-C18	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C19	CAPACITOR,FXD CER DIEL, 56PF, 10%, 200V (A2)	913-4003-000		81349	CK05BX560K
C19	CAPACITOR,FXD CER DIEL, 18PF, PORM10%, 200V (B2)	913-5019-040		81349	CK05BX180K
C19	CAPACITOR,FXD MICA DIEL, 24PF, PORM 0.5PF, 50V	912-4141-160		72136	DM5E240D050WV
C20	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-170		56289	199D106X0020CB1
C21	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V (B1)	913-5019-440		81349	CK06BX104K
C21	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C22	CAPACITOR,FXD CER DIEL, 1UF, 20%, 50V	913-3279-270		16546	CY30C105H
C23	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
C24	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V (B1)	913-5019-440		81349	CK06BX104K
C24	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C25-C27	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
C28	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C29	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-170		56289	199D106X0020CB1
C30,C31	CAPACITOR,FXD ELCTLT, 1UF, 20%, 35V	184-9102-350		56289	199D105X0035BB1
C32	CAPACITOR,FXD CER DIEL, 56PF, 10%, 200V (A2)	913-4003-000		81349	CK05BX560K
C32	CAPACITOR,FXD CER DIEL, 47PF, 10%, 200V	913-4002-000		81349	CK05BX470K
C33	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C34,C35	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
C36	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C37	CAPACITOR,FXD CER DIEL, 0.47UF, 20%, 50V	913-3279-250		16546	CY30C474H
C38	CAPACITOR,FXD ELCTLT, 33UF, 20%, 25V	184-9102-260		56289	199D1009
C39,C40	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C41	CAPACITOR,FXD ELCTLT, 220UF, M10ZP75%, 20V	183-1277-200		56289	600D227G020DG5
C42	NOT USED				
C43	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070		56289	199D475X0010BB1
C44	CAPACITOR,FXD CER DIEL, 0.022UF, PORM10%, 50V	913-5019-240		81349	CK05BX223K
C45,C46	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C47,C48	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070		56289	199D475X0010BB1
C49	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V (A2)	913-5019-200		81349	CK05BX103K
C50,C51	CAPACITOR,FXD CER DIEL, 330PF, 10%, 200V	913-4012-000		81349	CK05BX331K
C52	CAPACITOR,FXD CER DIEL, 680PF, 10%, 200V	913-4016-000		81349	CK05BX681K
C53	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070		56289	199D475X0010BB1
C54	CAPACITOR,FXD CER DIEL, 0.01UF, PORM10%, 100V	913-5019-200		81349	CK05BX103K
C55,C56	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070		56289	199D475X0010BB1
C57	CAPACITOR,FXD ELCTLT, 33UF, 20%, 25V	184-9102-260		56289	199D1009
C58	CAPACITOR,FXD CER DIEL, 3300PF, PORM10%, 100V	913-5019-140		81349	CK05BX332K
C59,C60	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
C61	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-170		56289	199D106X0020CB1
C62	CAPACITOR,FXD ELCTLT, 4.7UF, 20%, 10V	184-9102-070		56289	199D475X0010BB1
C63	NOT USED				
C64,C65	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
C66,C67	CAPACITOR,FXD ELCTLT, 10UF, 20%, 20V	184-9102-170		56289	199D106X0020CB1
C68	CAPACITOR,FXD CER DIEL, 100PF, 10%, 200V	913-4006-000		81349	CK05BX101K
C69-C72	CAPACITOR,FXD ELCTLT, 47UF, 20%, 20V	184-9102-190		56289	196D239
Q1	TRANSISTOR	352-0661-020		07263	2N2222A
Q2	TRANSISTOR	352-0551-010		04713	2N2907A
Q3,Q4	TRANSISTOR	352-0661-020		07263	2N2222A
Q5	TRANSISTOR	352-0551-010		04713	2N2907A
Q6,Q7	TRANSISTOR	352-0661-020		07263	2N2222A
Q8	TRANSISTOR	352-0551-010		04713	2N2907A
Q9	TRANSISTOR (ESDS)	352-0759-020		00872	2N44092
Q10,Q11	TRANSISTOR	352-0661-020		07263	2N2222A
Q12	TRANSISTOR (ESDS)	352-0605-010		22229	2N2608
R1	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR07G681KS
R2	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R3	RESISTOR,FXD CMPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS
R4	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R5	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R6	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR07G681KS
R7	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R8	RESISTOR,FXD CMPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS
R9	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R10	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R11	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR07G681KS
R12	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE DM CODE	MFR CODE	MFR PART NUMBER
R13	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R14	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R15	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R16	RESISTOR,FXD CMPSN, 27K, 10%, 1/4W	745-0800-000		81349	RCR07G273KS
R17	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R18	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R19	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R20	RESISTOR,FXD CMPSN, 47K, 10%, 1/4W	745-0809-000		81349	RCR07G473KS
R21	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R22	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R23	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R24	RESISTOR,FXD CMPSN, 0.15MEGO, 10%, 1/4W (B2)	745-0827-000		81349	RCR07G154KS
R24	RESISTOR,FXD FILM, 150K, 1%, 1/8W	705-3604-090		81349	RN55D1503F
R25	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R26	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R27	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R28	RESISTOR,VAR 10K, 10%, 3/4W	382-0012-290		80294	3006P1-103
R29	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R30	RESISTOR,FXD CMPSN, 68K, 10%, 1/4W	745-0815-000		81349	RCR07G683KS
R31,R32	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R33	RESISTOR,FXD CMPSN, 68K, 10%, 1/4W (B2)	745-0815-000		81349	RCR07G683KS
R33	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	RN55D6812F
R34	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R35	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R36,R37	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR07G470KS
R38	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R39	RESISTOR,FXD FILM, 140 OHMS, 1%, 1/8W	705-0955-000		81349	RN55D1400F
R40	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W (B1)	745-0821-000		81349	RCR07G104KS
R40	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R41,R42	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R43	RESISTOR,VAR 10K, 20%, 1/2W	382-0038-070		80294	3306P1-103
R44-R47	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R48	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R49	RESISTOR,FXD CMPSN, 68K, 10%, 1/4W	745-0815-000		81349	RCR07G683KS
R50	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R51	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R52	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR07G681KS
R53	NOT USED				
R54	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R55	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R56	RESISTOR,FXD CMPSN, 27K, 10%, 1/4W	745-0800-000		81349	RCR07G273KS
R57	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R58	NOT USED				
R59	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R60	NOT USED				
R61	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R62	RESISTOR,FXD CMPSN, 0.15MEGO, 10%, 1/4W (B2)	745-0827-000		81349	RCR07G154KS
R62	RESISTOR,FXD FILM, 150K, 1%, 1/8W	705-3604-090		81349	RN55D1503F
R63	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R64	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R65	RESISTOR,VAR 10K, 10%, 3/4W	382-0012-290		80294	3006P1-103
R66	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R67	RESISTOR,FXD CMPSN, 68K, 10%, 1/4W	745-0815-000		81349	RCR07G683KS
R68,R69	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R70	RESISTOR,FXD CMPSN, 68K, 10%, 1/4W (B2)	745-0815-000		81349	RCR07G683KS
R70	RESISTOR,FXD FILM, 68.1K, 1%, 1/8W	705-1084-000		81349	RN55D6812F
R71	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/4W	745-0713-000		81349	RCR07G101KS
R72	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R73	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR07G470KS
R74	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R75	RESISTOR,FXD CMPSN, 47 OHMS, 10%, 1/4W	745-0701-000		81349	RCR07G470KS
R76	RESISTOR,FXD FILM, 140 OHMS, 1%, 1/8W	705-0955-000		81349	RN55D1400F
R77	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W (B1)	745-0821-000		81349	RCR07G104KS
R77	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R78,R79	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R80	RESISTOR,VAR 10K, 20%, 1/2W	382-0038-070		80294	3306P1-103
R81	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R82	RESISTOR,FXD CMPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS
R83-R86	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/4W	745-0725-000		81349	RCR07G221KS
R87	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R88	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R89	NOT USED				
R90	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R91	RESISTOR,FXD CMPSN, 0.47MEGO, 10%, 1/4W	745-0845-000		81349	RCR07G474KS
R92	RESISTOR,FXD CMPSN, 0.22MEGO, 10%, 1/4W	745-0833-000		81349	RCR07G224KS
R93	NOT USED				
R94	RESISTOR,FXD CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R95,R96	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R97	RESISTOR,FXD CMPSN, 68K, 10%, 1/4W (A2)	745-0815-000		81349	RCR07G683KS
R97	RESISTOR,FXD FILM, 56.2K, 1%, 1/8W	705-1080-000		81349	RN55D5622F
R98	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R99	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R100	RESISTOR,FXD CMPSN, 0.15MEGO, 10%, 1/4W (A2)	745-0827-000		81349	RCR07G154KS
R100	RESISTOR,FXD FILM, 287K, 1%, 1/8W	705-1114-000		81349	RN55D2873F
R101	RESISTOR,FXD CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R102,	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R103					
R104	RESISTOR,FXD CMPSN, 2.7 OHMS, 5%, 1/4W	745-4377-000		81349	RCR07G2R7J9
R105	RESISTOR,FXD CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R106	RESISTOR,FXD CMPSN, 6.8K, 10%, 1/4W	745-0779-000		81349	RCR07G682KS
R107	RESISTOR,FXD CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R108	RESISTOR,FXD CMPSN, 6.8K, 10%, 1/4W (A1)	745-0779-000		81349	RCR07G682KS



Receive Audio, Schematic Diagram
Figure 8 (Sheet 3)



Receive Audio, Schematic Diagram
Figure 8 (Sheet 3)

MODIFICATION HISTORY

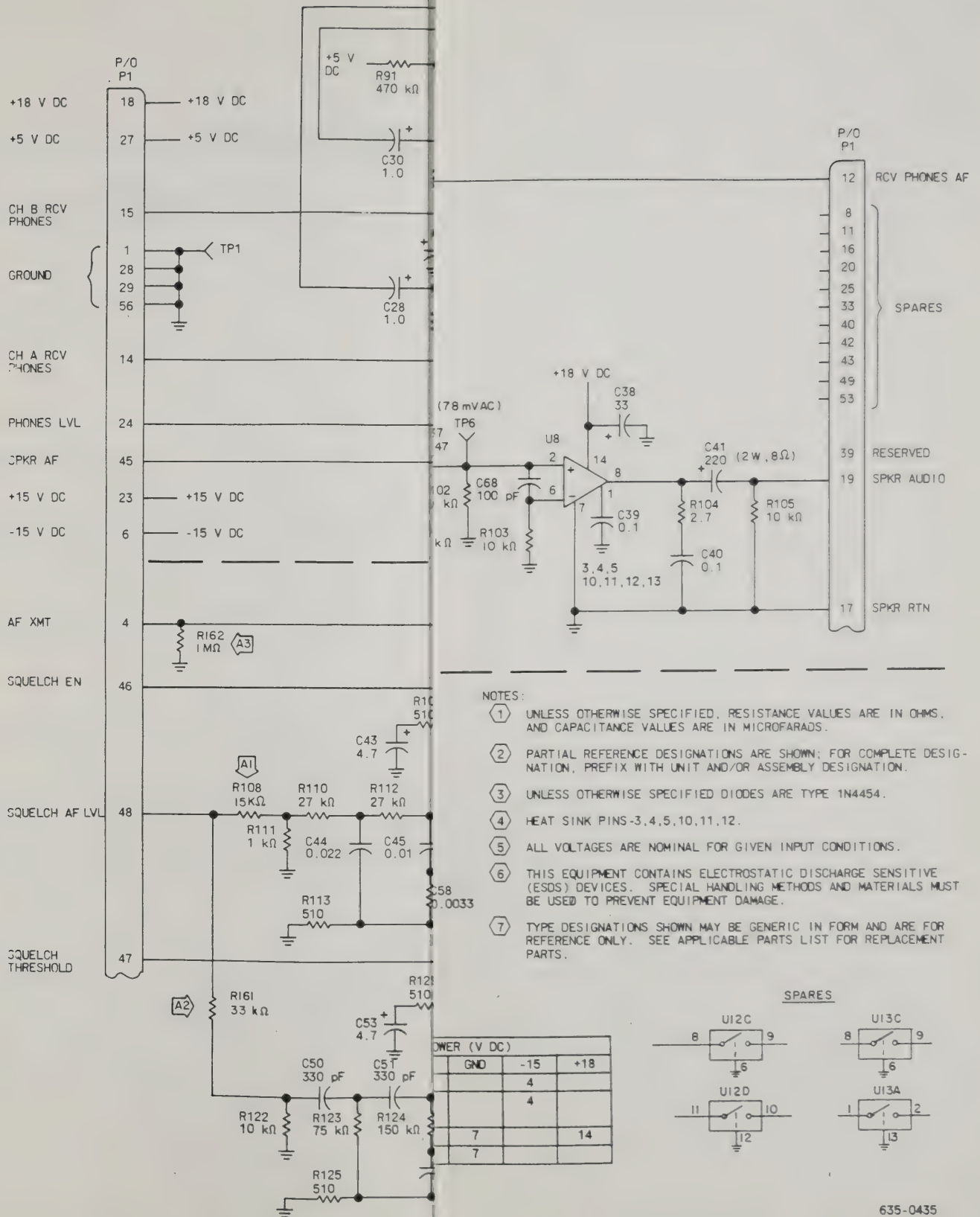
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed: R108 from 6800Ω to 15kΩ. R134 from 56.2kΩ to 24.9kΩ.	REV E and above
A2	Removed C49, 0.01 μF. Added R161, 33kΩ, in same location as C49 was removed. Changed: C7 from 56 pF to 18 pF C9 from 56 pF to 47 pF C19 from 56 pF to 18 pF C32 from 56 pF to 47 pF R97 from 68kΩ to 56.2kΩ R100 from 150kΩ to 287kΩ R115 from 51kΩ, 5% to 51.1kΩ, 1% R116 from 56kΩ, 10% to 56.2kΩ, 1% R127 from 56kΩ, 10%, to 56.2kΩ, 1% R128 from 51kΩ, 5% to 51.1kΩ, 1% R144 from 4700Ω to 27kΩ Added R161, 33kΩ	REV F and above
A3	Added R162, 1MΩ	REV H and above
B1	Changed: C10 from 0.1 μF to 1.0 μF C13 from 0.1 μF to 1.0 μF C21 from 0.1 μF to 1.0 μF C24 from 0.1 μ to 1.0 μF R40 from 100 kΩ to 10 kΩ R77 from 100 kΩ to 10 kΩ R159 from 100 kΩ to 10 kΩ R160 from 100 kΩ to 10 kΩ	REV K and above
Note Modification history through REV K has been included in all 635-0748-002 receive audio cards.		
B2	Changed: C7 from 18 pF to 24 pF C19 from 18 pF to 24 pF R24 from 150 kΩ, 10% to 150 kΩ, 1% R33 from 68 kΩ, 10% to 68.1 kΩ, 1% R62 from 150 kΩ, 10% to 150 kΩ, 1% R70 from 68 kΩ, 10% to 68.1 kΩ, 1%	REV N and above

MODIFICATION HISTORY		
REVISION IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	EFFECTIVITY
A1	Changed: R108 from 6800Ω to 15kΩ. R134 from 56.2kΩ to 24.9kΩ.	REV E and above
A2	Removed C49, 0.01 μF. Added R161, 33kΩ, in same location as C49 was removed. Changed: C7 from 56 pF to 18 pF C9 from 56 pF to 47 pF C19 from 56 pF to 18 pF C32 from 56 pF to 47 pF R97 from 68kΩ to 56.2kΩ R100 from 150kΩ to 287kΩ R115 from 51kΩ, 5% to 51.1kΩ, 1% R116 from 56kΩ, 10% to 56.2kΩ, 1% R127 from 56kΩ, 10%, to 56.2kΩ, 1% R128 from 51kΩ, 5% to 51.1kΩ, 1% R144 from 4700Ω to 27kΩ Added R161, 33kΩ	REV F and above
A3	Added R162, 1MΩ	REV H and above
B1	Changed: C10 from 0.1 μF to 1.0 μF C13 from 0.1 μF to 1.0 μF C21 from 0.1 μF to 1.0 μF C24 from 0.1 μ to 1.0 μF R40 from 100 kΩ to 10 kΩ R77 from 100 kΩ to 10 kΩ R159 from 100 kΩ to 10 kΩ R160 from 100 kΩ to 10 kΩ	REV K and above

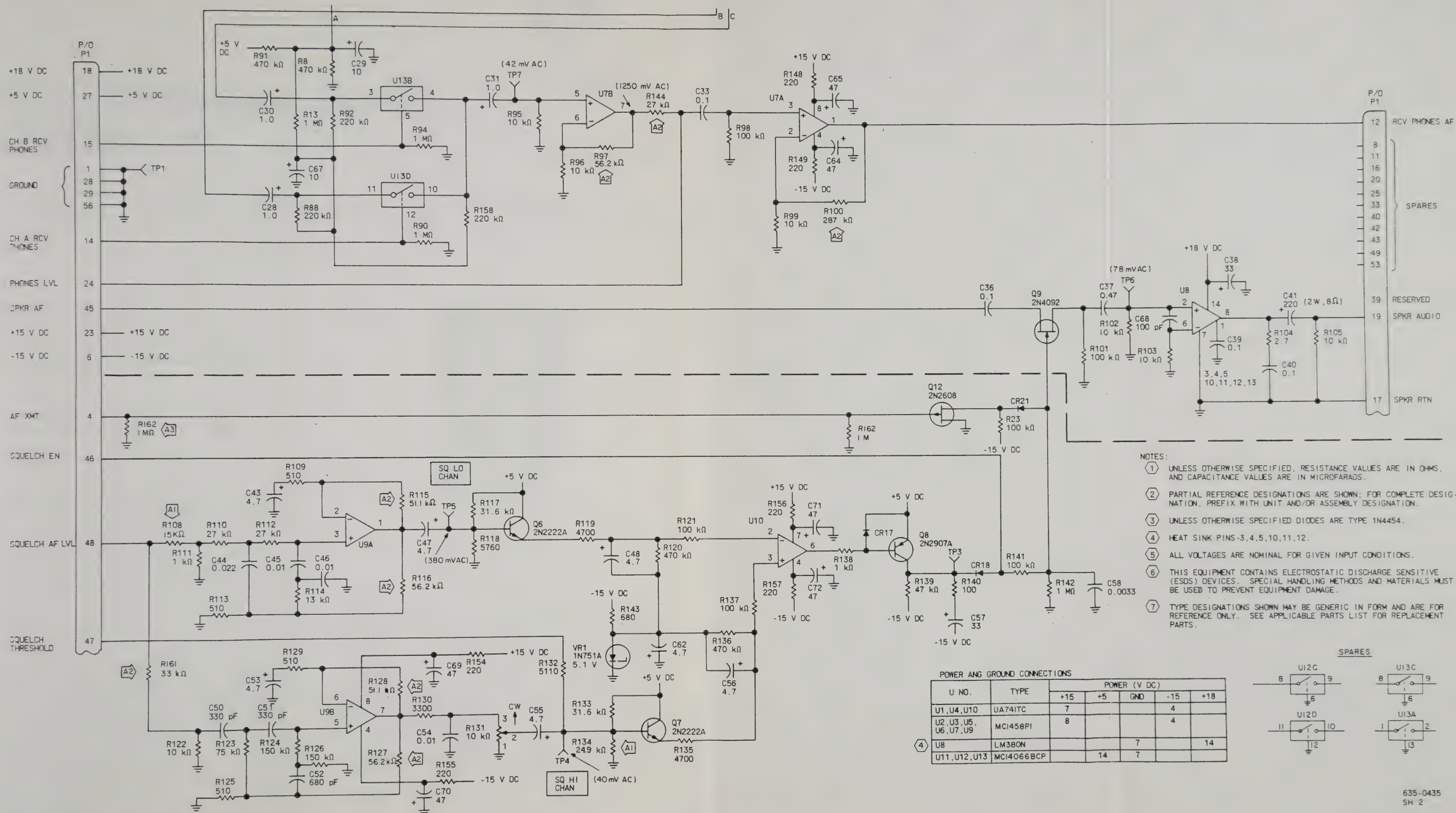
Note

Modification history through REV K has been included in all 635-0748-002 receive audio cards.

B2	Changed: C7 from 18 pF to 24 pF C19 from 18 pF to 24 pF R24 from 150 kΩ, 10% to 150 kΩ, 1% R33 from 68 kΩ, 10% to 68.1 kΩ, 1% R62 from 150 kΩ, 10% to 150 kΩ, 1% R70 from 68 kΩ, 10% to 68.1 kΩ, 1%	REV N and above
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Receive Audio, Schematic Diagram
Figure 8 (Sheet 5)



Receive Audio, Schematic Diagram
Figure 8 (Sheet 5)



Rockwell
International

instructions

Collins Telecommunications Products Division

523-0770716-001211

1 January 1981

Frequency Standard Switch (646-6558-001)

Printed in USA

1. DESCRIPTION

Frequency standard switch 646-6558-001, shown in figure 1, consists of a chassis, a 2-layer planar card, and four coaxial connections.

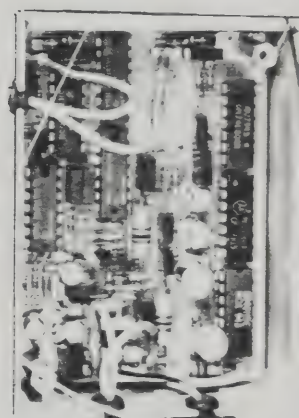
2. PRINCIPLES OF OPERATION (Refer to the schematic diagram.)

2.1 General

The frequency standard switch provides two separate 100-kHz outputs. In addition, a performance monitor signal is provided to external circuits. Operating power of $+5 \pm 0.1$ V dc, 100 mA, is required from an external source. Two rf input signals are required. The external standard rf input may be 5 MHz, 1 MHz, or 100 kHz. The oven standard rf input is 1 MHz.

2.2 External Standard Input

Switch S1 must be set to the frequency of the external standard input signal applied to J23. When switch S1 is set to the 100-kHz position, the input signal is routed through NAND gates U1A, U1B, and U1C, switch S1, and applied as a 100-kHz signal to amplifier Q1. When switch S1 is set to the 1-MHz position, the input signal is routed through NAND gates U1A and U1B to frequency divider U2. Frequency divider U2 divides the input frequency (1 MHz) by ten. This signal (100 kHz) is routed through switch S1 to amplifier Q1. When switch S1 is set to the 5-MHz position, the input signal is routed through NAND gates U1A and U1B and frequency dividers U2 (divide by 10) and U3 (divide by 5). This signal (100 kHz) is routed through switch S1 to amplifier Q1.



TPA-3075-017

Frequency Standard Switch
Figure 1

When an external standard signal is applied and the NAND gates (U1A, U1B, and U1C) and frequency dividers (U2 and U3) are operational, a logic 0 signal is produced at the input to NAND gate U5B. This produces a logic 1 signal at the output of NAND gate U5B. A logic 1 energizes electronic switch U4A. The closed contacts of switch U4A connect the 100-kHz signal from switch S1 to the input of NAND gate U5A. This signal is amplified by FET Q2. Transistors Q3 and Q4 are frequency splitters that provide separate 100-kHz output frequencies.

2.3 Oven Standard Input

The oven standard rf input of 1 MHz is routed through NAND gates U6A and U6B to frequency divider U7. The 1-MHz signal is divided by ten and routed as a 100-kHz signal to electronic switch U4B.

If the external standard input signal is not applied or the circuit malfunctions, switch U4B is closed. The 100-kHz signal is routed through NAND gate U5A to transistors Q2, Q3, and Q4. This signal is amplified by FET Q2. Transistors, Q3 and Q4 are frequency splitters that provide separate 100-kHz output frequencies.

2.4 Performance Monitor

A performance monitor signal is provided to external circuits from the output of NAND gate U5D. When the external standard input signal is active, a logic 1 signal is provided on the performance monitor output line.

3. TESTING/TROUBLESHOOTING PROCEDURES

3.1 Test Equipment and Power Requirements

Test equipment and power sources required to test, troubleshoot, and repair the frequency standard switch are listed in the maintenance section of this instruction book.

3.2 Testing and Troubleshooting

The test procedures in table 1 check the total performance of the frequency standard switch. The procedures permit isolation of a fault to a specific component or circuit when the results are used with the schematic diagram to trace the source of the fault.

Table 1. Frequency Standard Switch, Testing and Troubleshooting Procedures.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Test setup	a. Set dc power supply for +5-V dc output. b. Connect a ground lead from the dc power supply to black lead on the frequency standard switch. c. Connect +5 V dc to red lead on frequency standard switch. d. Connect a 50-ohm load to J1 and J56.		
2. Oven standard input	a. Connect the rf signal generator to P1. Set the rf signal generator frequency to 1 MHz. Adjust the output level for 0.1 V rms. b. Measure the rf output level and frequency at J1. c. Measure the rf output level and frequency at J56. d. Set the rf signal generator output level to 2.0 V rms. e. Measure the output levels at J1 and J56. f. Change rf signal generator frequency by 1000 Hz. g. Measure the output frequency at J1 and J56.	Output level: 0.4 to 1.5 V rms Frequency: 100 kHz Output level: 1.5 to 2.5 V rms Frequency: 100 kHz Same as tests 2b and 2c Frequency changes by 100 Hz from 100 kHz reference	Check U6, U7, U4B, U5A, Q2, Q4, and associated circuits. Check U6, U7, U4B, U5A, Q3, and associated circuits. Same as tests 2b and 2c. Same as tests 2b and 2c.

Table 1. Frequency Standard Switch, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. External standard input	a. Connect rf signal generator to J23 (external standard input). Set the rf signal generator frequency to 5 MHz. Adjust the output level for 0.5 V rms. b. Set switch S1 on the frequency standard switch to 5 MHz. c. Measure the rf output level and frequency at J1. d. Measure the rf output level and frequency at J56. e. Change rf signal generator frequency by 5000 Hz. f. Measure the output frequency at J1 and J56. g. Set the rf signal generator frequency to 1 MHz. Adjust the output level for 0.5 V rms. h. Set switch S1 on the frequency standard switch to 1 MHz. i. Measure the rf output level and frequency at J1. j. Measure the rf output level and frequency at J56. k. Change rf signal generator frequency by 1000 Hz. l. Measure the output frequency at J1 and J56. m. Set the rf signal generator frequency to 100 kHz. Adjust the output level for 0.5 V rms. n. Set switch S1 on the frequency standard switch to 100 kHz. o. Measure the rf output level and frequency at J1. p. Measure the rf output level and frequency at J56.	Output level: 0.4 to 1.5 V rms Frequency: 100 kHz Output level: 1.5 to 2.5 V rms Frequency: 100 kHz Frequency changes by 100 Hz from 100-kHz reference Output level: 0.4 to 1.5 V rms Frequency: 100 kHz Output level: 1.5 to 2.5 V rms Frequency: 100 kHz Frequency changes by 100 Hz from 100-kHz reference Output level: 0.4 to 1.5 V rms Frequency: 100 kHz Output level: 1.5 to 2.5 V rms Frequency: 100 kHz Frequency changes by 100 Hz from 100-kHz reference Output level: 0.4 to 1.5 V rms Frequency: 100 kHz Output level: 1.5 to 2.5 V rms Frequency: 100 kHz	Check U1A, B U2, S1, U3, U4A and associated circuits. Same as test 3c. Same as tests 3c and 3d. Check U1A, U1B, U2, S1, and associated circuits. Same as test 3i. Same as test 3i. Check U1A, B, C, S1, and associated circuit. Same as test 3o.
(Cont)			

Table 1. Frequency Standard Switch, Testing and Troubleshooting Procedures (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3. (Cont)	q. Change rf signal generator frequency by 100 Hz. r. Measure the output frequency at J1 and J56.	Frequency changes by 100 Hz from 100-kHz reference	Same as test 3o.
4. Performance monitor	a. Connect one rf signal generator to P1 and another rf signal generator to J3. b. Set both rf signal generators for 1 MHz. Adjust the output levels for 0.5 V rms. c. Set switch S1 on the frequency standard switch to 1 MHz. d. Connect frequency counter to J2. e. Change frequency of rf signal generator connected to P1 (oven standard input) by 1 kHz. f. Measure logic level on performance monitor output (blue lead). g. Measure frequency at J56. h. Disconnect rf signal generator from J23 (external standard input). i. Measure logic level on performance monitor output (blue lead). j. Measure frequency at J56.	Logic 1 100 kHz Logic 0 Frequency changes by 100 Hz from the 100 kHz observed in test 4g	Check U5D and associated circuit. Same as test 4f. Check U5D and associated circuit. Same as test 4i.

4. REPAIR

Repair of the frequency standard switch is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

5. PARTS LIST/DIAGRAMS

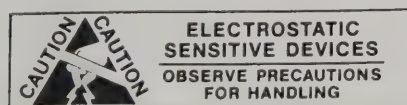
5.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special

handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.



This paragraph assists in identification, requisition, and issuance of parts and in maintenance of the equipment. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included in the schematic diagram (figure 2). The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The Collins part number and description are listed for each reference designator. In addition, the manufacturer's code and part number are listed when applicable.

5.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modifications.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the **DESCRIPTION** column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the **EFFECTIVITY** column of the modification history.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are the manufacturer's names and addresses for the manufacturer's codes used in this parts list.

<u>CODE</u>	<u>MANUFACTURER'S NAME AND ADDRESS</u>
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75222
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV 464 ELLIS ST MOUNTAIN VIEW CA 94042
17856	SILICONIX INC 2201 LAURELWOOD RD SANTA CLARA CA 95054
18324	SIGNETICS CORP 811 E ARQUES SUNNYVALE CA 94086
56289	SPRAGUE ELECTRIC CO NORTH ADAMS MA 01247
81349	MILITARY SPECIFICATION
94375	AUTOMATIC CONNECTOR INC 400 MORELAND RD COMMACK NY 11725
95146	ALCO ELECTRONIC PRODUCTS INC P O BOX 1348 LAWRENCE MA 01842
96906	MILITARY STANDARD

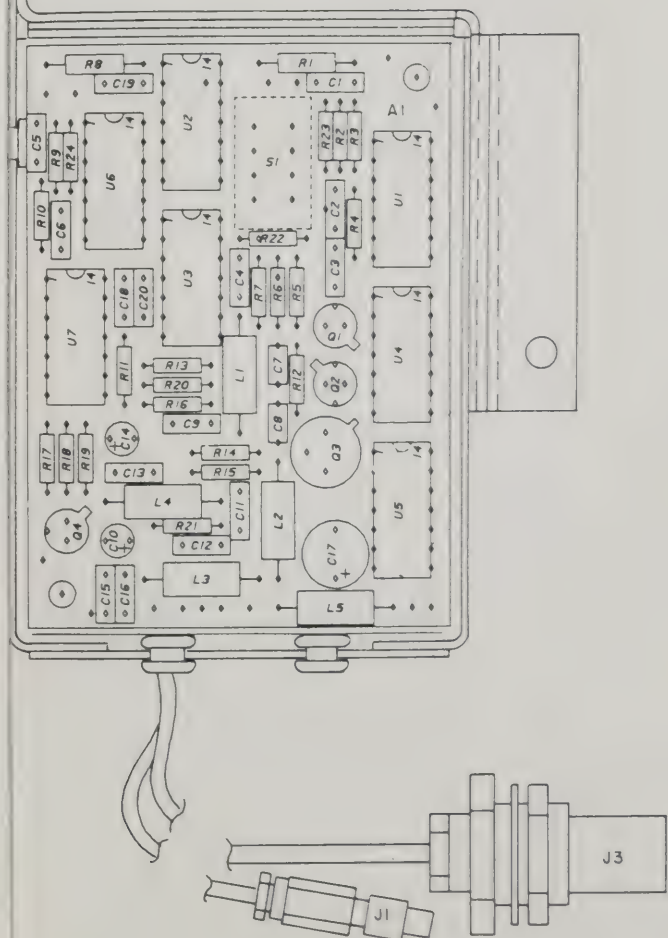
5.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

<u>CIRCUIT CARD/ SUBASSEMBLY</u>	<u>COLLINS PART NUMBER</u>	<u>LATEST EFFECTIVITY</u>
Frequency Standard Switch	646-6558-001	REV —

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	U Q C
	FREQUENCY STANDARD SWITCH	646-6558-001	
A1	AUTO SWITCH-OVER	642-3570-001	
J1	CONNECTOR, PLUG ELEC	357-7115-000	
J2, J3	CONNECTOR, RCPT ELEC	357-7129-010	
P1	CONNECTOR, PLUG ELEC	357-9600-000	
	AUTO SWITCH-OVER A1 (ESDS)	642-3570-001	
C1-C6	CAPACITOR, FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440	
C7, C8	CAPACITOR, FXD CER DIEL, 2200PF, PORM10%, 100V	913-5019-120	
C9	CAPACITOR, FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440	
C10	CAPACITOR, FXD TMTLM ELCTLT, 33UF, 20%, 10V	184-9102-090	
C11, C12	CAPACITOR, FXD CER DIEL, 0.047UF, PORM10%, 100V	913-5019-400	
C13	CAPACITOR, FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440	
C14	CAPACITOR, FXD TMTLM ELCTLT, 33UF, 20%, 10V	184-9102-090	
C15, C16	CAPACITOR, FXD CER DIEL, 0.047UF, PORM10%, 100V	913-5019-400	
C17	CAPACITOR, FXD TMTLM ELCTLT, 100UF, 20%, 10V	184-9102-100	
C18-C20	CAPACITOR, FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440	
L1	COIL, RF 1000UH	240-2715-490	
L2	COIL, RF 100UH	240-2715-370	
L3	COIL, RF 22UH	240-2715-290	
L4	COIL, RF 100UH	240-2715-370	
L5	COIL, RF 22UH	240-2715-290	
Q1	TRANSISTOR	352-0661-020	
Q2	TRANSISTOR (ESDS)	352-0756-010	
Q3	TRANSISTOR	352-0661-010	
Q4	TRANSISTOR	352-0661-020	
R1	RESISTOR, FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0704-000	
R2, R3	RESISTOR, FXD CHPSN, 15K, 10%, 1/8W	745-2383-000	
R4	RESISTOR, FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000	
R5	RESISTOR, FXD CHPSN, 22K, 10%, 1/8W	745-2389-000	
R6	RESISTOR, FXD CHPSN, 33K, 10%, 1/8W	745-2395-000	
R7	RESISTOR, FXD CHPSN, 47K, 10%, 1/8W	745-2401-000	
R8	RESISTOR, FXD CHPSN, 56 OHMS, 10%, 1/4W	745-0704-000	
R9-R11	RESISTOR, FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000	
R12	RESISTOR, FXD CHPSN, 390 OHMS, 10%, 1/8W	745-2326-000	
R13	RESISTOR, FXD CHPSN, 680 OHMS, 10%, 1/8W	745-2335-000	
R14	RESISTOR, FXD CHPSN, 10K, 10%, 1/8W	745-2377-000	
R15	RESISTOR, FXD CHPSN, 33K, 10%, 1/8W	745-2395-000	
R16	RESISTOR, FXD CHPSN, 1K, 10%, 1/8W	745-2341-000	
R17	RESISTOR, FXD CHPSN, 10K, 10%, 1/8W	745-2377-000	
R18	RESISTOR, FXD CHPSN, 12K, 10%, 1/8W	745-2380-000	
R19	RESISTOR, FXD CHPSN, 220 OHMS, 10%, 1/8W	745-2317-000	
R20	RESISTOR, FXD CHPSN, 1K, 10%, 1/8W	745-2341-000	
R21	RESISTOR, FXD CHPSN, 100 OHMS, 10%, 1/8W	745-2304-000	
R22	RESISTOR, FXD CHPSN, 4.7K, 10%, 1/8W	745-2365-000	
R23	RESISTOR, FXD CHPSN, 33K, 10%, 1/8W	745-2395-000	
R24	RESISTOR, FXD CHPSN, 10K, 10%, 1/8W	745-2377-000	
S1	SWITCH, MINIATURE SLIDE 250MA	266-0253-060	
U1	INTEGRATED CIRCUIT LOGIC GATE	351-1523-110	
U2, U3	INTEGRATED CIRCUIT DECADE COUNTER	351-1636-010	
U4	INTEGRATED CIRCUIT (ESDS)	351-8252-010	
U5	INTEGRATED CIRCUIT DCTL MOS (ESDS)	351-8159-340	
U6	INTEGRATED CIRCUIT LOGIC GATE	351-1523-110	
U7	INTEGRATED CIRCUIT DECADE COUNTER	351-1636-010	



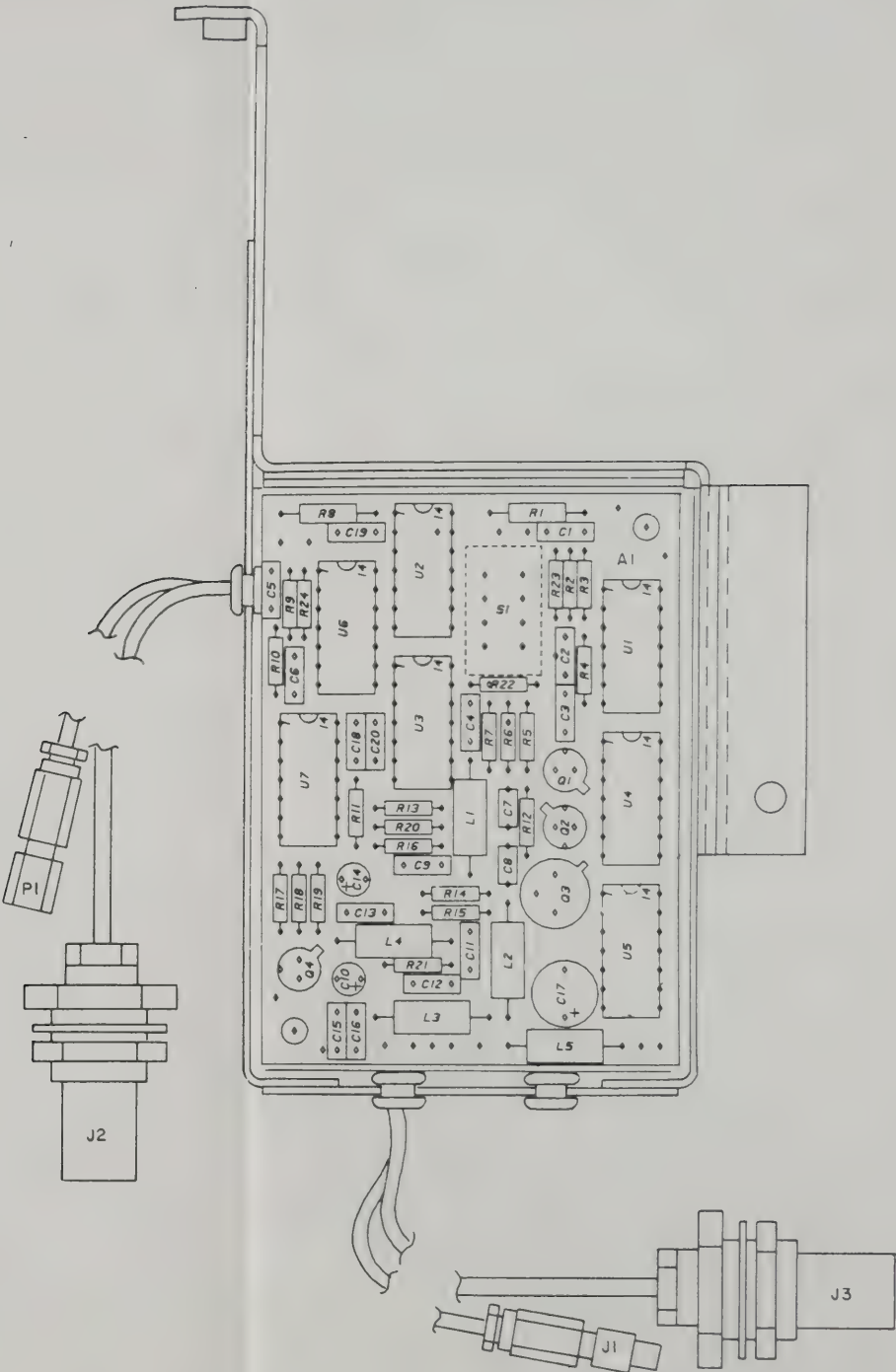
ELECTROSTATIC
SENSITIVE DEVICES
OBSERVE PRECAUTIONS
FOR HANDLING

TPA-2796-019

Frequency Standard Switch, Schematic Diagram
Figure 2 (Sheet 1 of 2)

PARTS LIST

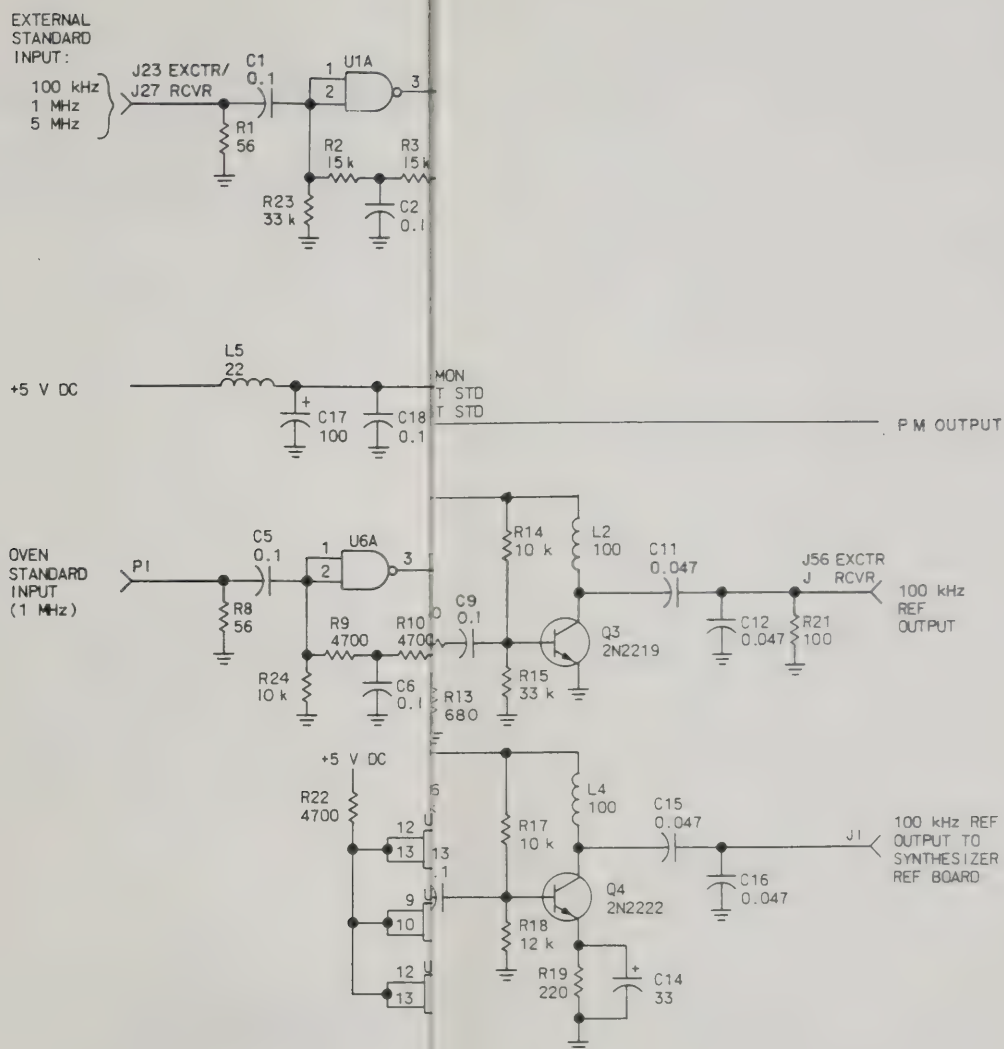
REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
A1	FREQUENCY STANDARD SWITCH	646-6558-001			
J1	AUTO SWITCH-OVER	642-3570-001			
J2,J3	CONNECTOR,PLUG ELEC	357-7115-000		81349	M39012-74-0004
P1	CONNECTOR,RCPT ELEC	357-7129-010		94375	801-B3800875
	CONNECTOR,PLUG ELEC	357-9600-000		81349	M39012-73-0003
	AUTO SWITCH-OVER A1 (ESDS)	642-3570-001			
C1-C6	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C7,C8	CAPACITOR,FXD CER DIEL, 2200PF, PORM10%, 100V	913-5019-120		81349	CK05BX222K
C9	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C10	CAPACITOR,FXD TMTLM ELCTLT, 33UF, 20%, 10V	184-9102-090		56289	1990336X00100B1
C11,C12	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 100V	913-5019-400		81349	CK06BX473K
C13	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
C14	CAPACITOR,FXD TMTLM ELCTLT, 33UF, 20%, 10V	184-9102-090		56289	1990336X00100B1
C15,C16	CAPACITOR,FXD CER DIEL, 0.047UF, PORM10%, 100V	913-5019-400		81349	CK06BX473K
C17	CAPACITOR,FXD TMTLM ELCTLT, 100UF, 20%, 10V	184-9102-100		56289	1960235
C18-C20	CAPACITOR,FXD CER DIEL, 0.1UF, PORM10%, 100V	913-5019-440		81349	CK06BX104K
L1	COIL,RF 1000UH	240-2715-490		96906	MS75089-23
L2	COIL,RF 100UH	240-2715-370		96906	MS75089-11
L3	COIL,RF 22UH	240-2715-290		96906	MS75089-3
L4	COIL,RF 100UH	240-2715-370		96906	MS75089-11
L5	COIL,RF 22UH	240-2715-290		96906	MS75089-3
Q1	TRANSISTOR	352-0661-020		07263	2N2222A
Q2	TRANSISTOR (ESDS)	352-0756-010		17856	2N4416
Q3	TRANSISTOR	352-0661-010		07263	2N2219A
Q4	TRANSISTOR	352-0661-020		07263	2N2222A
R1	RESISTOR,FXD CMPSN, 56 OHMS, 10%, 1/4W	745-0704-000		81349	RCR07G560KS
R2,R3	RESISTOR,FXD CMPSN, 15K, 10%, 1/8W	745-2383-000		81349	RCR05G153KS
R4	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R5	RESISTOR,FXD CMPSN, 22K, 10%, 1/8W	745-2389-000		81349	RCR05G223KS
R6	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R7	RESISTOR,FXD CMPSN, 47K, 10%, 1/8W	745-2401-000		81349	RCR05G473KS
R8	RESISTOR,FXD CMPSN, 56 OHMS, 10%, 1/4W	745-0704-000		81349	RCR07G560KS
R9-R11	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R12	RESISTOR,FXD CMPSN, 390 OHMS, 10%, 1/8W	745-2326-000		81349	RCR05G391KS
R13	RESISTOR,FXD CMPSN, 680 OHMS, 10%, 1/8W	745-2335-000		81349	RCR05G681KS
R14	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R15	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R16	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R17	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
R18	RESISTOR,FXD CMPSN, 12K, 10%, 1/8W	745-2380-000		81349	RCR05G123KS
R19	RESISTOR,FXD CMPSN, 220 OHMS, 10%, 1/8W	745-2317-000		81349	RCR05G221KS
R20	RESISTOR,FXD CMPSN, 1K, 10%, 1/8W	745-2341-000		81349	RCR05G102KS
R21	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1/8W	745-2304-000		81349	RCR05G101KS
R22	RESISTOR,FXD CMPSN, 4.7K, 10%, 1/8W	745-2365-000		81349	RCR05G472KS
R23	RESISTOR,FXD CMPSN, 33K, 10%, 1/8W	745-2395-000		81349	RCR05G333KS
R24	RESISTOR,FXD CMPSN, 10K, 10%, 1/8W	745-2377-000		81349	RCR05G103KS
S1	SWITCH, MINIATURE SLIDE 250MA	266-0253-060		95146	SLS-230PC
U1	INTEGRATED CIRCUIT LOGIC GATE	351-1523-110		18324	N74LS00N
U2,U3	INTEGRATED CIRCUIT DECADE COUNTER	351-1636-010		01295	SN74LS90N
U4	INTEGRATED CIRCUIT (ESDS)	351-8252-010		02735	CD4066BE
U5	INTEGRATED CIRCUIT DGTL MOS (ESDS)	351-8159-340		07263	40118PC
U6	INTEGRATED CIRCUIT LOGIC GATE	351-1523-110		18324	N74LS00N
U7	INTEGRATED CIRCUIT DECADE COUNTER	351-1636-010		01295	SN74LS90N



CAUTION
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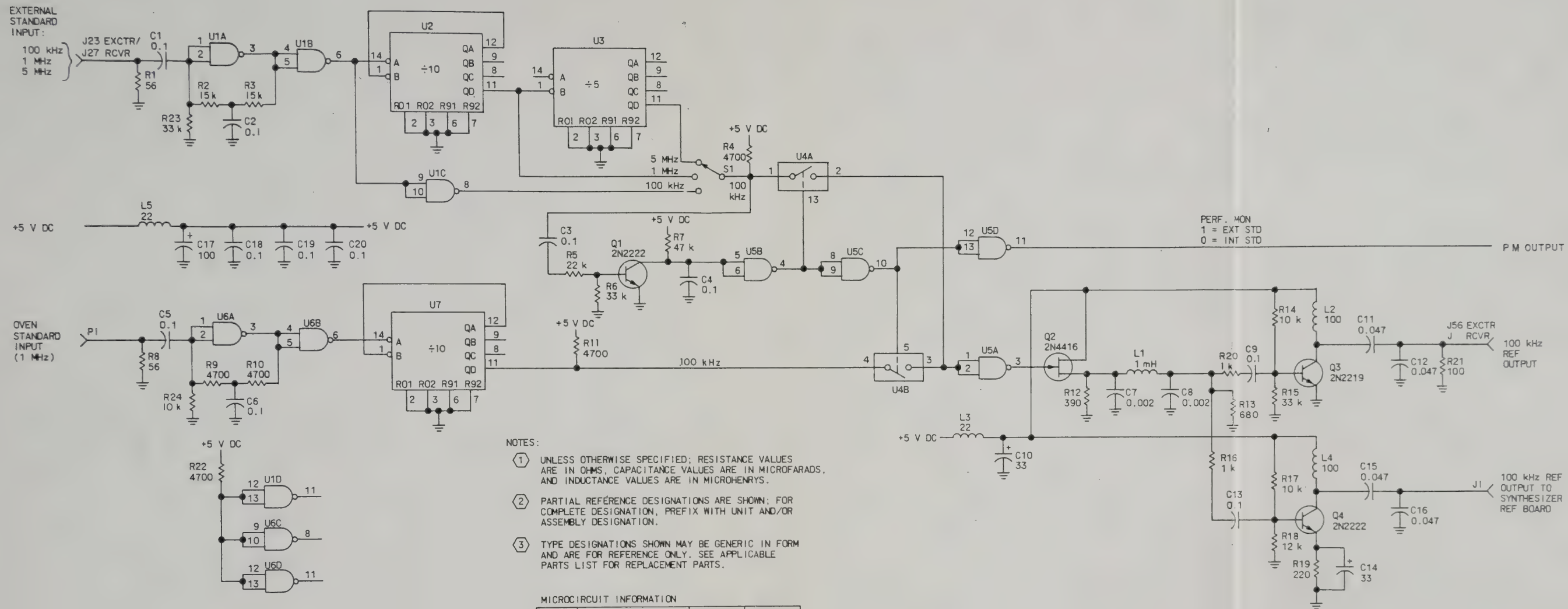
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Frequency Standard Switch, Schematic Diagram
Figure 2 (Sheet 1 of 2)



634-6885

Frequency Standard Switch, Schematic Diagram
Figure 2 (Sheet 2)



634-6885

Frequency Standard Switch, Schematic Diagram
Figure 2 (Sheet 2)



Rockwell
International

instructions

TS-8010 Card Extender Kit (622-3431-001, -002)

Collins Telecommunications Products Division

Printed in USA

523-0767968-003211

3rd Edition, 1 January 1981

TS-8010 Card Extender Kit
(622-3431-001, -002)

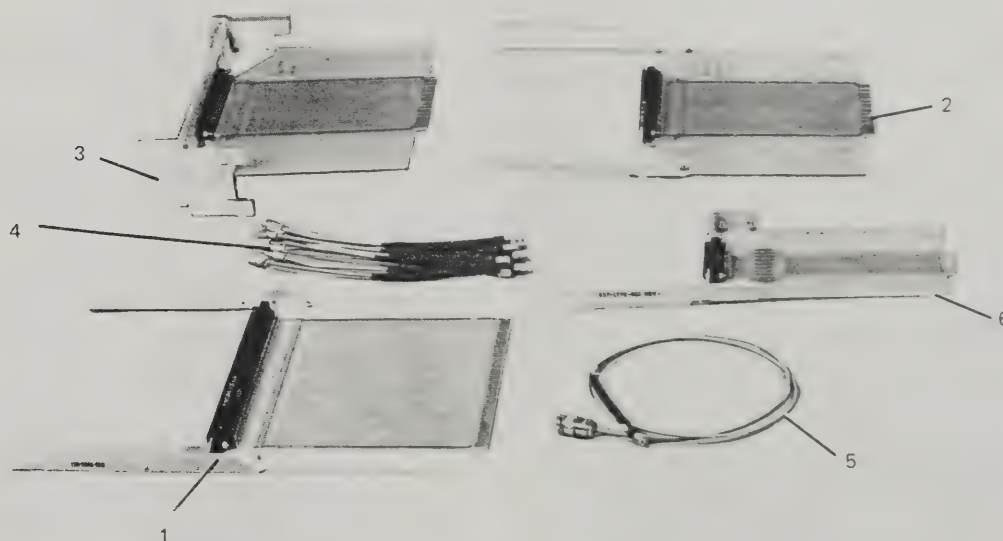
1. DESCRIPTION

The TS-8010 Card Extender Kit 622-3431-001, -002 contains all cables and extender cards necessary for extending cards and modules in the HF-80 series receivers, exciters, and controls. These extenders enable testing and troubleshooting of individual circuit cards in hot mockup or in on-line situations without the need of sophisticated test fixtures or test equipment.

The TS-8010 622-3431-001 contains all cables and extenders necessary for testing and troubleshooting the HF-80 series receivers, exciters, receiver-exciter, and controls; and the 851S-() series receivers.

The TS-8010 622-3431-002 contains only those extenders necessary for testing and troubleshooting the HF-80 series controls.

Refer to figure 1 and table 1 for the complement of these card extender kits.



TP5-4916-017

TS-8010 Card Extender Kit

Figure 1

NOTICE: This section replaces second edition dated 1 June 1978.

523-0767968-003211

Table 1. TS-8010 Card Extender Kit Complement.

ITEM NO	COLLINS PART NUMBER	DESCRIPTION	622-3431-	
			001	002
1	635-0913-001	130-pin edge-on extender	X	X
2	635-0915-001	56-pin edge-on extender	X	X
3	635-0915-002	Rf module extender	X	
4	635-9686-001	Subminiax coax extender	7	
5	635-9686-002	Subminiax coax/BNC extender	X	
6	637-2843-001	Synthesizer extender	X	

2. REPAIR

Repair of the TS-8010 Card Extender Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

3. PARTS LIST/DIAGRAMS

This paragraph assists in identification, requisition, and issuance of parts, and in maintenance of the equipment. The Collins part number and description for each nonstandard replacement part are listed in table 2.

All pins and shields of the extenders are one-to-one connections; therefore a schematic diagram of the extenders is not shown.

Table 2. TS-8010 Card Extender Kit Parts List.

DESCRIPTION	COLLINS PART NUMBER
130-pin edge-on extender	635-0913-001
Card guide (mounts inside extender frames)	150-0810-040
Connector	372-2274-060
Printed wiring board	600-1993-770
Extender frame (left)	635-9683-001
Extender frame (right)	635-9683-002
56-pin edge-on extender	635-0915-001
Card guide (mounts inside extender frames)	150-0810-040
Connector	372-7515-040
Printed wiring board	600-1993-771
Extender frame (left)	635-9685-001
Extender frame (right)	635-9685-002

Table 2. TS-8010 Card Extender Kit Parts List (Cont).

DESCRIPTION	COLLINS PART NUMBER
Rf module extender	635-0915-002
Connector	372-7515-040
Printed wiring board	600-1993-771
Extender frame	635-9681-001
Subminiax coax extender	635-9686-001
Rf connector	357-7207-010
Rf connector	357-7207-020
Coaxial cable, RG-316/U	425-0146-010
Subminiax coax/BNC extender	635-9686-002
Rf connector	357-7207-010
Rf connector, BNC	357-7279-010
Coaxial cable, RG-316/U	425-0146-010
Synthesizer extender	637-2843-001
Card guide (mounts inside extender brackets)	150-0810-030
Connector	372-7515-050
Printed wiring board	600-1993-050
Extender bracket (left)	637-1775-001
Extender bracket (right)	637-1776-001



Rockwell
International

instructions

AC-8012 Oven Standard Kit (622-3460-001)

Collins Telecommunications Products Division

Printed in USA

523-0768671-002211

2nd Edition, 1 January 1981

AC-8012 Oven Standard Kit
(622-3460-001)

1. DESCRIPTION

AC-8012 Oven Standard Kit 622-3460-001 contains an rf oscillator, an external phase-lock card, and all the cables and hardware necessary to install them in the units listed in table 1. When installed, the oven standard provides a high-stability crystal oscillator mounted inside a proportionally controlled oven.

Table 1. AC-8012 Oven Standard Kit, Equipment Used On.

EQUIPMENT	COLLINS PART NUMBER
HF-8010 Exciter	622-3389-()
HF-8010A Exciter	622-3395-()
HF-8014 Exciter	622-3472-()
HF-8014A Exciter	622-3473-()
HF-8050 Receiver	622-3385-()
HF-8050A Receiver	622-3393-()
HF-8054 Receiver	622-3474-()
HF-8054A Receiver	622-3475-()
HF-8070 Receiver-Exciter	622-3387-()
HF-8070A Receiver-Exciter	622-3394-()
851S-1 Receiver	622-4272-()

Note

This kit is factory installed on some configurations of these units.

The AC-8012 rf oscillator provides a 1-MHz sine-wave frequency output at a level of 0.40 volt rms into 50 ohms. Accuracy of the rf oscillator exceeds that of the texo built into the used-on equipments and uses a proportionally controlled oven instead of the temperature-compensating network to improve accuracy over the controlled temperature range, -20 to +70 °C (-4 to +158 °F).

The AC-8012 rf oscillator has two frequency adjustments: a coarse adjustment (FREQ ADJ - COARSE) to adjust the output frequency to $\pm 1.5 \times 10^{-6}$ of the nominal frequency with $\pm 5 \times 10^{-9}$ or better resolution, and a fine adjustment (FREQ ADJ - FINE) to adjust the output frequency to 2.0×10^{-8} minimum to 4.0×10^{-8} maximum with minimum resolution of $\pm 2 \times 10^{-10}$.

The AC-8012 rf oscillator requires +18.0 $\pm$ 0.9 V dc, 8.0 watts maximum during warmup; 2.5 watts nominal after warmup; and +5.0 $\pm$ 0.25 V dc, 20 mA maximum.

2. INSTALLATION (Refer to figure 1.)

Installation of AC-8012 Oven Standard Kit (622-3460-001) consists of installation of external phase-lock on the synthesizer reference (REF STD) and installation of oscillator assembly Y1 (637-9135-001).

Note

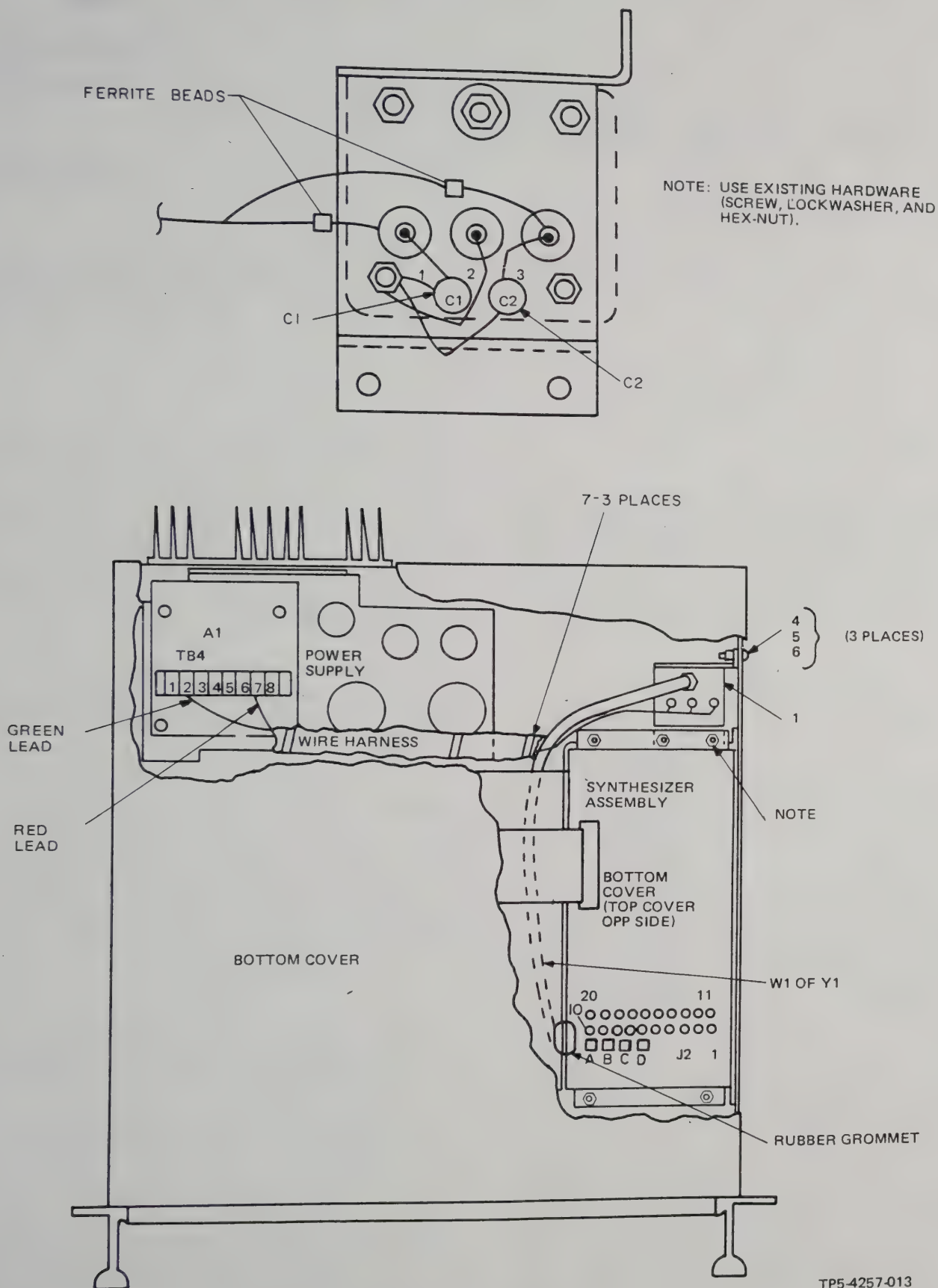
Refer to maintenance section of this instruction book for planar card component replacement procedures.

2.1 External Phase-Lock (635-0655-001) Installation

- Remove top cover from unit.
- Remove top cover from synthesizer assembly.
- Remove REF STD from synthesizer assembly.
- Remove cover from left side rf compartment on REF STD, and move jumper clip from INT to EXT position (strap for external operation).

NOTICE: This section replaces first edition dated 1 June 1978.

523-0768671-002211



AC-8012 Oven Standard Kit Installation
Figure 1

TP5-4257-013

- e. Reinstall left side rf compartment cover on REF STD.
- f. Mount external phase-lock (table 2, item 2) to REF STD with two lockscrews (table 2, item 3).
- g. Set jumper clip on external phase-lock to 1-MHz position.
- h. Insert REF STD in its original position in synthesizer assembly.
- i. Reinstall synthesizer assembly top cover.
- j. Reinstall unit top cover.

Note

Some configurations of the synthesizer assembly do not contain a rubber grommet. In configurations not having a rubber grommet, place W1 in one of the cutouts for wiring, using care not to pinch wires when reinstalling synthesizer assembly bottom cover.

Note

Some configurations of the synthesizer sideboard contain posts on the J2 pad and some only contain solder holes. In the configurations containing solder holes, do not insert leads more than 0.508 cm (0.20 in) into sideboard when soldering.

2.2 Oscillator Assembly (637-9135-001)**Installation**

- a. Remove bottom cover from unit.
- b. Remove attaching hardware referred to in note on figure 1.
- c. Install oscillator assembly (table 2, item 1) to chassis using three screws (table 2, item 4), three lockwashers (table 2, item 5), three hexnuts (table 2, item 6), and attaching hardware removed in step b above.
- d. Install the two wires from oscillator assembly (table 2, item 1) to power supply A1 (green wire to A1TB4-2 and red wire to A1TB4-7).
- e. Using three cable ties (table 2, item 7), tie the two wires that connect the oscillator assembly to power supply A1.
- f. Remove bottom cover of synthesizer assembly and install oscillator assembly cable W1 (table 2, P/O item 1) to synthesizer sideboard as follows:
 1. Thread cable W1 through rubber grommet as shown in figure 1.

2. Solder center conductor of W1 (insulated) to J2-A post or pad of synthesizer sideboard.
3. Solder shield top of W1 (uninsulated) to J2-B post or pad of synthesizer sideboard.
- g. Reinstall synthesizer assembly bottom cover.
- h. Reinstall unit bottom cover.

3. REPAIR

Repair of the AC-8012 Oven Standard Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

Table 2. AC-8012 Oven Standard Kit Parts List.

ITEM	DESCRIPTION	COLLINS PART NUMBER	QUANTITY
1	Oscillator assembly	637-9135-001	1
	Radio frequency oscillator	277-0472-010	1
	Capacitor, 0.1 μ F	913-3681-000	2
	Ferrite bead	288-0915-030	2
2	External phase-lock	635-0655-001	1
3	Lockscrew - 0.112 x 40 x 0.187	330-1716-130	2
4	Machined screw - 0.138 x 32 x 0.375	343-0169-000	3
5	Lockwasher - 0.138	310-0096-000	3
6	Hexnut - 0.138 x 32	313-0045-000	3
7	Cable tie	435-1169-200	3
8	Drawing envelope	520-8360-132	1
	Installation kit, oven oscillator -- AC-8012	622-3460-001	1

4. PARTS LIST/DIAGRAMS

This paragraph assists in identification, requisition, and issuance of parts, and in installation/maintenance of the equipment. The Collins part number and description of each nonstandard replacement part are listed in table 2.

Radio Frequency Oscillator 277-0472-010 is a non-repairable assembly and should be returned to factory if defective.

External Phase-Lock 635-0655-001 is repairable and is covered in Synthesizer Reference (623-2085-001) instructions (Collins part number 523-0767970) included in this instruction book.

AC-8013 External Standard Kit (622-3461-001)



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Collins Telecommunications Products Division

Printed in USA

523-0768672-003211
3rd Edition, 1 January 1981

AC-8013 External Standard Kit
(622-3461-001)

1. DESCRIPTION

The AC-8013 External Standard Kit 622-3461-001 contains an external phase-lock card, a cable assembly, and the hardware necessary to install them in the units listed in table 1. When installed, the external standard kit allows for an external high-stability frequency source to be connected to the synthesizer reference.

The external phase-lock card (P/O AC-8013 kit), when installed, allows an external reference frequency of 5 MHz, 1 MHz, or 100 kHz to be supplied to the units listed. The external reference signal must be 0.5 to 1.5 volts rms sine wave into 50 ohms with accuracy depending on the accuracy of the signal source.

2. INSTALLATION (Refer to figure 1.)

Installation of AC-8013 External Standard Kit (622-3461-001), consists of installation of external phase-lock on the synthesizer reference (REF STD) and installation of cable assembly W1 (637-9136-001).

Note

Refer to maintenance section of this instruction book for planar card component replacement procedures.

2.1 External Phase-Lock (635-0655-001) Installation

- Remove top cover from unit.
- Remove top cover from synthesizer assembly.
- Remove REF STD from synthesizer assembly.

Table 1. AC-8013 External Standard Kit, Equipment Used On.

EQUIPMENT	COLLINS PART NUMBER
HF-8010 Exciter	622-3389-()
HF-8010A Exciter	622-3395-()
HF-8014 Exciter	622-3472-()
HF-8014A Exciter	622-3473-()
HF-8050 Receiver	622-3385-()
HF-8050A Receiver	622-3393-()
HF-8054 Receiver	622-3474-()
HF-8054A Receiver	622-3475-()
HF-8070 Receiver-Exciter	622-3387-()
HF-8070A Receiver-Exciter	622-3394-()
851S-1 Receiver	622-4272-()

Note

If an oven standard kit is installed, the oven standard must first be removed before the external standard kit is installed.

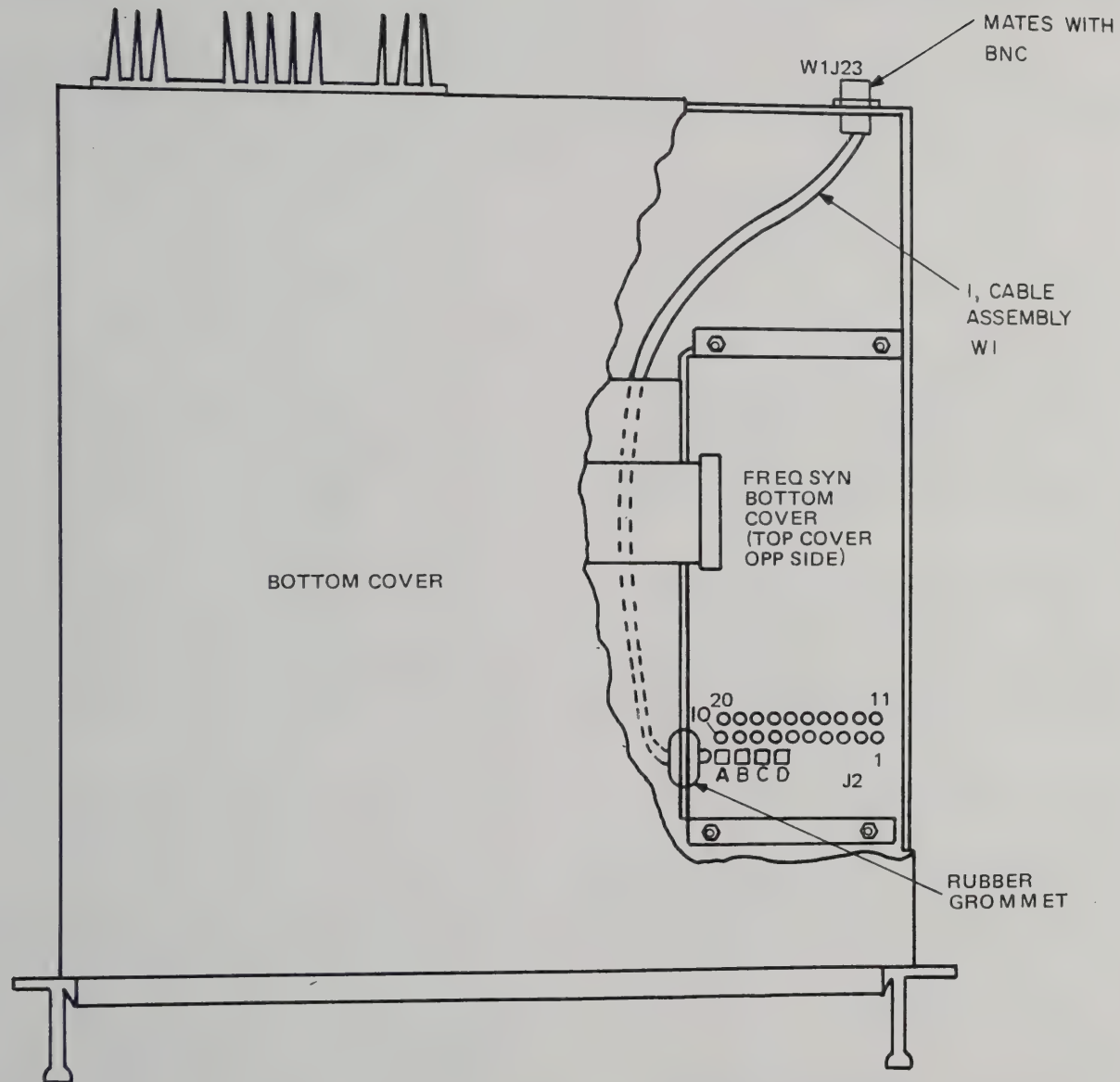
- Remove cover from left side rf compartment on REF STD, and move jumper clip from INT to EXT position (strap for external operation).
- Reinstall left side rf compartment cover on REF STD.
- Mount external phase-lock (table 2, item 2) to REF STD with two lockscrews (table 2, item 3).
- Set jumper clip on external phase-lock to 1-MHz position.
- Insert REF STD in its original position in synthesizer assembly.
- Reinstall synthesizer assembly top cover.
- Reinstall unit top cover.

2.2 Cable Assembly W1 (637-9136-001) Installation

- Remove bottom cover from unit.
- Remove bottom cover from synthesizer assembly.

NOTICE: This section replaces second edition dated 1 October 1980.

523-0768672-003211



TP5-4258-013

*AC-8013 External Standard Kit Installation
Figure 1*

- c. Secure cable assembly W1 (table 2, item 1) to J23 position of rear panel and thread cable through rubber grommet to synthesizer assembly as shown in figure 1.

Note

Some configurations of the synthesizer assembly do not contain a rubber grommet. In configurations not having a rubber grommet, place W1 in one of the cutouts for wiring using care not to pinch wires when reinstalling synthesizer assembly bottom cover.

Some configurations of the synthesizer sideboard contain posts in the J2 pads and some only contain solder holes. In the configurations containing solder holes, do not insert leads more than 0.508 cm (0.20 in) into sideboard when soldering.

- d. Solder center conductor of W1 (insulated) to J2-A post or pad of synthesizer sideboard.

- e. Solder shield top of W1 (uninsulated) to J2-B post or pad of synthesizer sideboard.
f. Reinstall synthesizer assembly bottom cover.
g. Reinstall unit bottom cover.

3. REPAIR

Repair of the AC-8013 External Standard Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

4. PARTS LIST/DIAGRAMS

This paragraph assists in identification, requisition, and issuance of parts, and installation/maintenance of the equipment. The Collins part number and description for each nonstandard replacement part are listed in table 2.

External Phase-Lock 635-0655-001 is covered in Synthesizer Reference (623-2085-001) instructions (Collins part number 523-0767970) included in this instruction book.

Table 2. AC-8013 External Standard Kit, Parts List.

ITEM	DESCRIPTION	COLLINS PART NUMBER	QUANTITY
1	Cable assembly W1	637-9136-001	1
2	External phase-lock	635-0655-001	1
3	Lockscrew - 0.112 x 40 x 0.187	330-1716-130	2
4	Drawing envelope	520-8360-133	1
	Installation kit-external reference standard, AC-8013	622-3461-001	1



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AC-8014 Frequency Display Kit (622-3470-001, -002)

Collins Telecommunications Products Division

523-0770521-001211

1 October 1980

Printed in USA

AC-8014 Frequency Display Kit
(622-3470-001, -002)

1. DESCRIPTION

AC-8014 Frequency Display Kit 622-3470-() contains a frequency display and all cables and hardware necessary to install it in the units listed in table 1. When installed, the frequency display kit provides an LED display of the unit's selected frequency.

The AC-8014 frequency display provides a lighted display in 100- or 10-Hz increments. The AC-8014 Frequency Display Kit 622-3470-001 will modify one unit with 10-Hz tuning; the 622-3470-002 will modify one unit with 100-Hz tuning.

2. INSTALLATION

Installation of AC-8014 Frequency Display Kit consists of installation of A2A5 Frequency Display 637-1787-006 or 637-1787-007.

Note

Refer to maintenance section of this instruction book for planar card component replacement procedures.

2.1 Preparation of Unit

- Remove unit top and bottom covers.
- Remove front panel from unit by removing four hexhead screws and attaching hardware.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during removal of upper overlay panel.

Table 1. AC-8014 Frequency Display Kit, Equipment Used On.

EQUIPMENT	COLLINS PART NUMBER
HF-8010 Exciter	622-3389-()
HF-8010A Exciter	622-3395-()
HF-8014 Exciter	622-3472-()
HF-8014A Exciter	622-3473-()
HF-8050 Receiver	622-3385-()
HF-8050A Receiver	622-3393-()
HF-8054 Receiver	622-3474-()
HF-8054A Receiver	622-3475-()
HF-8070 Receiver-Exciter	622-3387-()
HF-8070A Receiver-Exciter	622-3394-()

- Remove upper overlay panel from front panel as follows:
 - Remove four Phillips-head screws and lockwashers that secure back of front panel to upper edge bar.
 - Remove four Phillips-head screws and lockwashers that secure back of front panel to panel support (middle bar on front panel).
 - Lift upper edge bar from front panel.
 - Carefully remove upper overlay panel.
- Remove cover plate on back of front panel by removing five Phillips-head screws and attaching hardware (screwheads on front of front panel).
- Disconnect ribbon cable from A2J4 (frequency switchboard).

523-0770521-001211

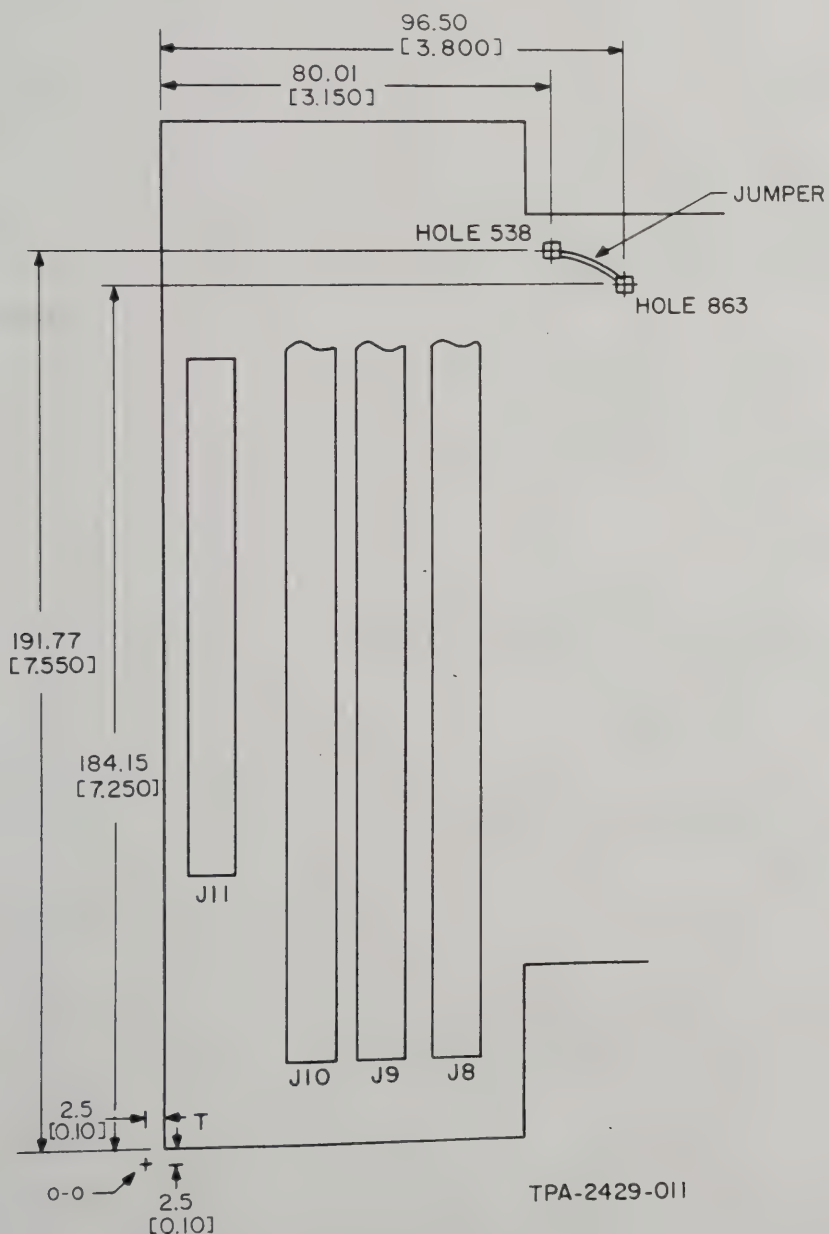
2.2 Sideboard Rework

Note

Sideboard rework is required for all sideboards 635-0749-001 through REV G (REV H and later do not require rework).

- Remove all plug-in cards and modules from sideboard assembly (A3 through A13).
- Tag and disconnect all plug-on ribbon cables from bottom of sideboard assembly (use cabling, connector layout, and pin numbering figure in the diagrams section to assist you).
- Remove sideboard 635-0749-001 from bottom of chassis.
- Add a jumper wire on bottom of sideboard between hole 538 (X = 3.2500, Y = 7.6500) and hole 863 (X = 3.900, Y = 7.3500). X and Y locations originate at board master 0-0 (A13 end of sideboard, front side, X = left to right, Y = front to back, 0-0 = 0.10 inch front and left of sideboard corner). Refer to figure 1.
- When sideboard modification is complete, stamp RWK H following the part number and REV letter, 637-1530-002 (REV ()).
- Reinstall sideboard to bottom of chassis.
- Reinstall all ribbon cables that were removed from bottom of chassis in step b.

NOTE:
DIMENSIONS ARE IN
MILLIMETERS
[INCHES].



Hole 538-Hole 863 Jumper Wire Location
Figure 1

2.3 Installation of Frequency Display

- a. Install new cover plate (supplied in kit) to back of front panel, using four Phillips-head screws (supplied in kit) and attaching hardware (screwheads on front of front panel).
- b. Mount panel support (middle bar on front panel) to front panel by using four Phillips-head screws and lockwashers.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care when installing upper overlay panel.

- c. Carefully install upper overlay panel into slot of middle bar on front panel.
- d. Carefully slide frequency display in place in front panel.
- e. Connect plug P8 of new wire harness (supplied in kit) to jack A2J5 on frequency display.
- f. Secure frequency display using four Phillips-head screws and attaching hardware.

- g. Connect plug P2 of new wire harness to jack A2J4 on frequency switchboard.
- h. Connect plug P2 of old wire harness to pendant connect on new wire harness.
- i. Install top and bottom covers of unit.

3. REPAIR

Repair of the AC-8014 Frequency Display Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

4. PARTS LIST/DIAGRAMS

This paragraph assists in identification, requisition, and issuance of parts, and installation/maintenance of the equipment. The Collins part number and description for each replacement part are listed in table 2.

Frequency Display 637-1781-006, -007 is covered in Frequency Display (637-1781-()) instructions (Collins part number 523-0767975) included in this instruction book.

Table 2. AC-8014 Frequency Display Kit Parts List.

DESCRIPTION	COLLINS PART NUMBER	QUANTITY 622-3470-()	
		-001	-002
Frequency display (10 Hz)	637-1781-007	1	
Frequency display (100 Hz)	637-1781-006		1
Screw 0.086-56 x 0.25	343-0072-000	8	8
Lockwasher 0.086	310-0275-000	8	8
Circuit card bracket	637-1546-001	2	2
Wire harness	634-8289-001	1	1
Cover plate	634-8273-001	1	1
Screw 0.086-56 x 0.375	343-0674-000	4	4
Nut 0.086-56	313-0037-000	4	4
Washer 0.086	310-6320-000	4	4
Wire, 30 AWG	428-0282-050	0.1 ft	0.1 ft



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Collins Telecommunications Products Division

523-0770717-001211

1 January 1981

AC-8015 Frequency Standard Switch Kit (622-3499-001)

Printed in USA

1. DESCRIPTION

AC-8015 Frequency Standard Switch Kit 622-3499-001 contains a frequency standard switch assembly, an installation drawing, and cable tie. The frequency standard switch kit may be installed in the units listed in table 1.

The frequency standard switch assembly provides two separate 100-kHz outputs. With an input signal of 1 kHz, the two 100-kHz output levels are 0.4 to 1.5 V rms and 1.5 to 2.5 V rms.

The frequency standard switch assembly requires $+5 \pm 0.1$ V dc, 100 mA as operating voltage.

2. INSTALLATION (Refer to figure 1)

The AC-8012 Oven Standard Kit (622-3460-001) must be installed before installing the AC-8015 Frequency Standard Switch Kit. Refer to the AC-8012 instructions (523-0768671) for installation instructions.

To install the AC-8015 Frequency Standard Switch Kit, proceed as follows:

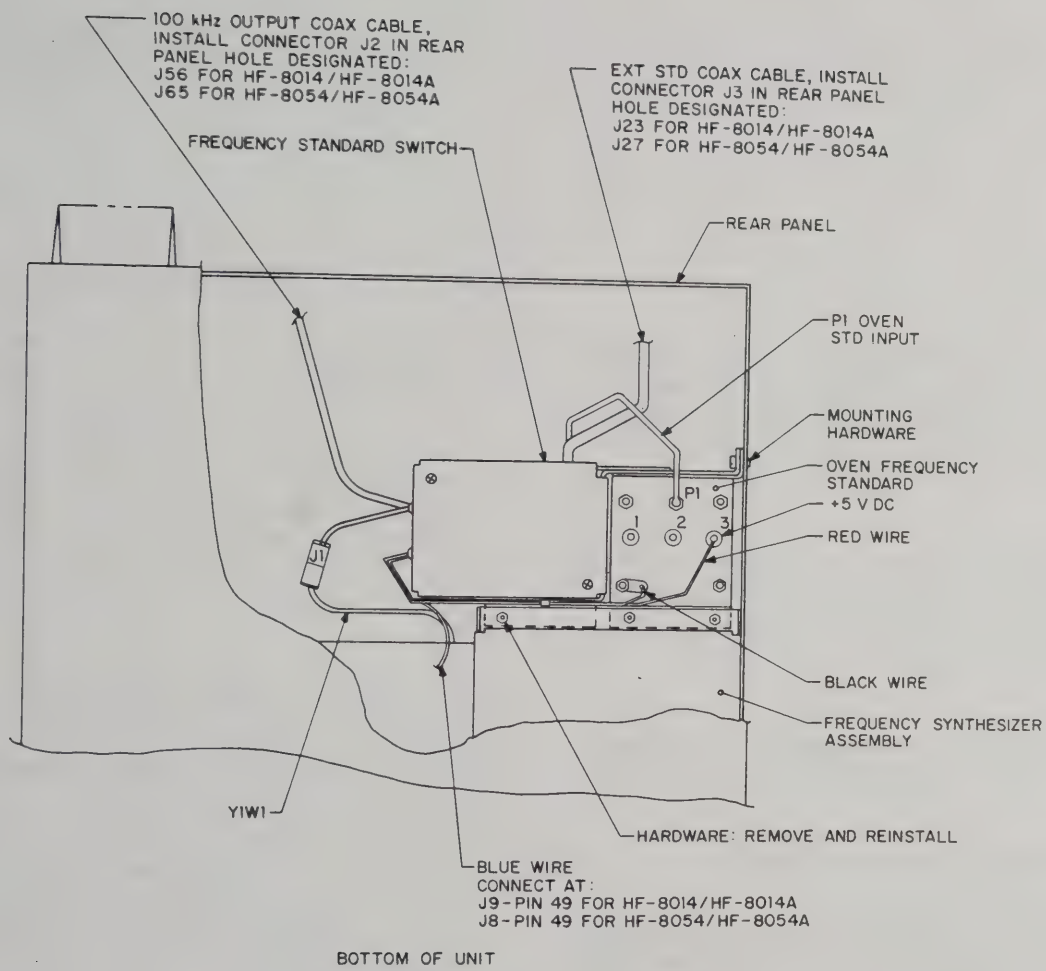
- Install AC-8012 Oven Standard Kit.
- Remove top cover of unit.
- Remove top cover of frequency synthesizer assembly.
- Remove frequency reference subassembly shown in figure 2.
- Refer to figure 2. Move the jumper clip on the external phase-lock card of the frequency reference

Table 1. Related Equipment.

EQUIPMENT	COLLINS PART NUMBER
HF-8014 Exciter	622-3472-()
HF-8014A Exciter	622-3473-()
HF-8054 Receiver	622-3474-()
HF-8054A Receiver	622-3475-()

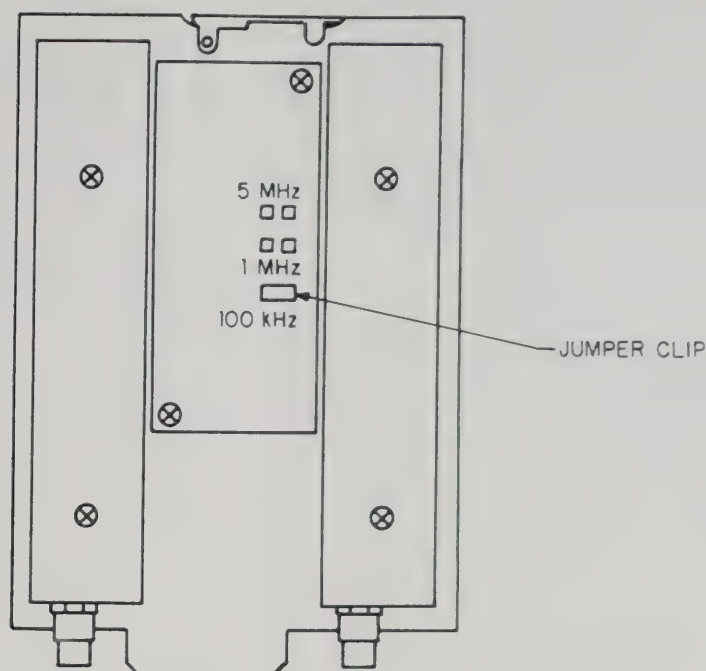
subassembly to the 100-kHz position as shown in figure 2.

- Replace frequency reference subassembly into frequency synthesizer assembly.
- Replace top cover of frequency synthesizer.
- Turn unit over. Remove bottom cover of unit.
- Install frequency standard switch assembly to chassis as shown in figure 1. Remove and reinstall hardware as noted.
- Install coaxial cables to rear panel as shown in figure 1.
- Disconnect coaxial cable connection (Y1W1) at oven frequency standard and reconnect to J1 of frequency standard switch assembly.
- Connect coaxial connector P1 of the frequency standard switch to the oven frequency standard as shown in figure 1.
- Connect the three wires (red, black, and blue) as shown in figure 1.
- Tie wires as required.
- On the frequency standard switch assembly, set switch S1 to the frequency (5 MHz, 1 MHz, or 100 kHz) of the external standard input.
- Replace bottom and top covers of unit.



TPA-2543-014

AC-8015 Frequency Standard Switch Kit Installation
Figure 1



TPA-2544-011

*Frequency Reference Card Strapping
Figure 2*

3. REPAIR

Repair of the AC-8015 Frequency Standard Switch Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

4. PARTS LIST/DIAGRAMS

Table 2 lists the Collins part number and description of the parts of the AC-8015.

The schematic diagram for the frequency standard switch assembly is included in a separate instruction (523-0770737).

Table 2. AC-8015 Frequency Standard Switch Kit Parts List.

ITEM	DESCRIPTION	COLLINS PART NUMBER	QUANTITY
1	Frequency standard switch	646-6558-001	1
2	Cable tie	435-1169-200	0.91 m (3 ft)
3	Drawing envelope (contains installation drawing)	520-8360-261	1

AC-8017/8017A 100-Hz to 10-Hz Conversion Kit (622-3453-001, -002)



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International

instructions

Collins Telecommunications Products Division

Printed in USA

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2nd Edition, 1 January 1981

AC-8017/8017A 100-Hz to 10-Hz Conversion Kit
(622-3453-001, -002)

1. DESCRIPTION

AC-8017 100-Hz to 10-Hz Conversion Kit 622-3453-001 contains a 10-Hz frequency switchboard assembly and a synthesizer decade card. When installed, the AC-8017 100-Hz to 10-Hz conversion kit provides 10-Hz tuning on all applicable units listed in table 1.

Note

If 100-Hz frequency display has been installed in unit it should be replaced with a 10-Hz display during installation of this kit.

Table 1. AC-8017/8017A 100-Hz to 10-Hz Conversion Kit, Equipment Used On.

EQUIPMENT	COLLINS PART NUMBER
AC-8017 100-Hz TO 10-Hz CONVERSION KIT 622-3453-001	
HF-8010 Exciter HF-8010A Exciter	622-3389-() 622-3395-()
HF-8014 Exciter HF-8014A Exciter	622-3472-() 622-3473-()
HF-8050 Receiver HF-8050A Receiver	622-3385-() 622-3393-()
HF-8054 Receiver HF-8054A Receiver	622-3474-() 622-3475-()
HF-8070 Receiver-Exciter HF-8070A Receiver-Exciter	622-3387-() 622-3394-()
AC-8017A 100-Hz TO 10-Hz CONVERSION KIT 622-3453-002	
HF-8090 Exciter Control HF-8091 Receiver Control HF-8092 Receiver-Exciter Control HF-8093 Exciter Control HF-8094 Receiver Control	622-3390-() 622-3391-() 622-3392-() 622-3476-() 622-3477-()

NOTICE: This section replaces first edition dated 1 June 1978.

523-0768676-002211

The AC-8017A 100-Hz to 10-Hz Conversion Kit 622-3453-002 contains a 10-Hz frequency switchboard assembly and a 10-Hz to 29-MHz frequency display. When installed, the AC-8017A 100-Hz to 10-Hz conversion kit provides 10-Hz tuning and a 10-Hz display on all applicable units listed in table 1.

2. INSTALLATION

Installation instructions for the AC-8017/8017A are divided into two procedures; instructions for installation of 622-3453-001 and instructions for installation of 622-3453-002.

Installation of AC-8017 100-Hz to 10-Hz Conversion Kit 622-3453-001 consists of replacing the existing frequency switchboard assembly with one from the kit, and configuring the synthesizer assembly for 10-Hz operation using the 100/10-Hz decade card supplied with the kit.

Installation of AC-8017A 100-Hz to 10-Hz Conversion Kit 622-3453-002 consists of replacing the existing frequency switchboard and frequency display assemblies using the assemblies supplied with the kit.

2.1 AC-8017 100-Hz to 10-Hz Conversion Kit 622-3453-001 Installation

a. Frequency Switchboard Replacement

Note

Retain hardware removed during disassembly for use in reassembly. Refer to unit parts list as an aid in disassembly and assembly.

1. Remove unit top cover.
2. Remove front panel from unit by removing four hexhead screws and attaching hardware.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during removal of upper overlay panel.

3. Remove upper overlay panel from front panel as follows:
 - (a) Remove four Phillips-head screws and lockwashers that secure back of front panel to upper edge bar.
 - (b) Remove four Phillips-head screws and lockwashers that secure back of front panel

to panel support (middle bar on front panel).

- (c) Lift upper edge bar from front panel.
 - (d) Carefully remove upper overlay panel.
4. Remove cover plate on back of front panel by removing five Phillips-head screws and attaching hardware (screws on front of front panel).
 5. Disconnect plug P2 from frequency switchboard jack A2J4.
 6. Remove frequency switchboard 635-0830-001 by removing four Phillips-head screws and attaching hardware (screwheads on front of front panel).
 7. Secure frequency switchboard 635-0830-002 supplied in kit to front panel using four Phillips-head screws and attaching hardware (screwheads on front of front panel).
 8. Connect plug P2 to jack A2J4 on frequency switchboard.
 9. Secure cover plate to back of front panel with five Phillips-head screws and attaching hardware (screwheads on front side of front panel).

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during replacement of upper overlay panel.

10. Insert upper overlay panel into slot on panel support (middle bar on front panel).
 11. Replace edge bar on top of front panel ensuring upper overlay panel fits properly.
 12. Secure upper overlay panel to front panel with eight Phillips-head screws and lockwashers.
 13. Secure front panel to unit with four hexhead screws and attaching hardware.
- b. Configuring Synthesizer Assembly 635-9697-001 for 10-Hz Operation
 1. Remove synthesizer assembly top cover.
 2. Remove END DECADE from A18 slot and install into A17 slot.
 3. Install decade card 623-2080-004 into the A18 slot.
 4. Reinstall synthesizer assembly top cover.
 5. Reinstall unit top cover.
 - c. Configuring Synthesizer Assembly 634-8201-001 for 10-Hz Operation
 1. Remove synthesizer assembly top cover.
 2. Remove END DECADE from A19 slot and install into A18 slot.

3. Install decade card 623-2080-004 into the A19 slot.
4. Reinstall synthesizer assembly top cover.
5. Reinstall unit top cover.

2.2 AC-8017A 100-Hz to 10-Hz Conversion Kit 622-3452-002 Installation

Note

Retain hardware removed during disassembly for reassembly. Refer to unit parts list as an aid in disassembly and assembly.

- a. Remove unit top cover.
- b. Remove frequency display as follows:
 1. Remove four Phillips-head screws and attaching hardware.
 2. Disconnect plug P8 from jack A2J5 on frequency display.
- c. Remove front panel from unit by removing four hexhead screws and attaching hardware.
- i. Insert upper overlay panel into slot on panel support (middle bar on front panel).
- j. Replace edge bar on top of front panel ensuring upper overlay panel fits properly.
- k. Secure upper overlay panel to front panel with eight Phillips-head screws and attaching hardware.
- l. Secure front panel to unit with four hexhead screws and attaching hardware.
- m. Install frequency display 637-1781-002 as follows:
 1. Connecting plug P8 to jack A2J5 on frequency display.
 2. Securing frequency display to mounts with four Phillips-head screws and attaching hardware.
- n. Reinstall unit top cover.

3. REPAIR

Repair of the AC-8017/8017A 100-Hz to 10-Hz Conversion Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during removal of upper overlay panel.

- d. Remove upper overlay panel from front panel as follows:
 1. Remove four Phillips-head screws and lockwashers that secure back of front panel to upper edge bar.
 2. Remove four Phillips-head screws and lockwashers that secure back of front panel to panel support (middle bar on front panel).
 3. Lift upper edge bar from front panel.
 4. Carefully remove upper overlay panel.
- e. Disconnect plug P2 from frequency switchboard jack A2J4.
- f. Remove frequency switchboard 635-0830-001 by removing four Phillips-head screws and attaching hardware (screwheads on front of front panel).
- g. Secure frequency switchboard 635-0830-002 supplied in kit to front panel using four Phillips-head screws and attaching hardware (screwheads on front of front panel).
- h. Connect plug P2 to jack A2J4 on frequency switchboard.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during replacement of upper overlay panel.

4. PARTS LIST/DIAGRAMS

This paragraph assists in identification, requisition, and issuance of parts, and in maintenance of the equipment. The Collins part number and description for each nonstandard replacement part are listed in table 2.

These cards are covered in the following instructions which are included in the associated instruction book.

- a. Frequency display (637-1781-001, -002) instructions (Collins part number 523-0767975).
- b. Frequency switchboard (635-0830-001, -002) instructions (Collins part number 523-0767947).
- c. Synthesizer decade (623-2080-001, -002, -003, -004) instructions (Collins part number 523-0767972).

Table 2. AC-8017/8017A 100-Hz to 10-Hz Conversion Kit Parts List.

DESCRIPTION	COLLINS PART NUMBER
AC-8017	622-3453-001
Frequency switchboard	635-0830-002
Synthesizer decade	623-2080-004
AC-8017A	622-3453-002
Frequency switchboard	635-0830-002
Frequency display	637-1781-002

AC-8018 10-Hz to 1-Hz Conversion Kit (622-3454-001)



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Collins Telecommunications Products Division

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AC-8018 10-Hz to 1-Hz Conversion Kit
(622-3454-001)

1. DESCRIPTION

AC-8018 10-Hz to 1-Hz Conversion Kit 622-3454-001 contains a single synthesizer decade card. When installed, the 10-Hz to 1-Hz conversion kit provides remote tuning in 1-Hz increments (in remotely controlled units). Refer to table 1 for equipment this kit is used on.

2. INSTALLATION

Installation of the AC-8018 10-Hz to 1-Hz Conversion Kit consists of configuring the synthesizer assembly for 1-Hz operation using decade card (100/10-Hz decade) supplied with the kit.

- Remove the unit top cover.
- Remove synthesizer assembly top cover.

Table 1. AC-8018 10-Hz to 1-Hz Conversion Kit, Equipment Used On.

EQUIPMENT	COLLINS PART NUMBER
*HF-8010 Exciter	622-3389-()
**HF-8010A Exciter	622-3395-()
*HF-8014 Exciter	622-3472-()
**HF-8014A Exciter	622-3473-()
*HF-8050 Receiver	622-3385-()
**HF-8050A Receiver	622-3393-()
*HF-8054 Receiver	622-3474-()
**HF-8054A Receiver	622-3475-()
*HF-8070 Receiver-Exciter	622-3387-()
**HF-8070A Receiver-Exciter	622-3394-()
¹ 851S-1 Receiver	622-4272-()
*With 10-Hz tuning, either factory installed or installed using AC-8017 100-Hz to 10-Hz Conversion Kit 622-3453-001; and with AC-8090 Remote Control Kit 622-3462-001 installed. **With 10-Hz tuning, either factory installed or installed using AC-8017 100-Hz to 10-Hz Conversion Kit 622-3453-001. ¹Remotely controlled, either factory installed or installed using AC-8090 Remote Control Kit 622-3462-001.	

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- c. Remove synthesizer 100/10-kHz decade from A17 slot and install in A16 slot.
- d. Install synthesizer 100/10-kHz decade from kit in A17 slot.
- e. Reinstall synthesizer assembly top cover.
- f. Reinstall unit top cover.

3. REPAIR

Repair of the AC-8018 10-Hz to 1-Hz Conversion Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance sec-

tion of this instruction book for planar card repair procedures.

4. PARTS LIST/DIAGRAMS

Synthesizer Decade 623-2080-004 is the only part in this kit.

Synthesizer Decade 623-2080-004 is covered in Synthesizer Decade (623-2080-001, -002, -003, -004) instructions (Collins part number 523-0767972) which are included in this instruction book.



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AC-8019 100-Hz to 1-Hz Conversion Kit (622-3455-001)

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AC-8019 100-Hz to 1-Hz Conversion Kit
(622-3455-001)

1. DESCRIPTION

AC-8019 100-Hz to 1-Hz Conversion Kit 622-3455-001 contains a 10-Hz frequency switchboard assembly and two synthesizer decade cards. When installed, the 100-Hz to 1-Hz conversion kit provides local tuning in 10-Hz increments (in all units) and remote tuning in 1-Hz increments (in remotely controlled units). Refer to table 1 for equipment this kit is used on.

Note

If 100-Hz Frequency Display has been installed in unit it should be replaced with a 10-Hz display when installing this kit.

Table 1. AC-8019 100-Hz to 1-Hz Conversion Kit,
Equipment Used On.

EQUIPMENT	COLLINS PART NUMBER
HF-8010 Exciter	622-3389-()
HF-8010A Exciter	622-3395-()
HF-8014 Exciter	622-3472-()
HF-8014A Exciter	622-3473-()
HF-8050 Receiver	622-3385-()
HF-8050A Receiver	622-3393-()
HF-8054 Receiver	622-3474-()
HF-8054A Receiver	622-3475-()
HF-8070 Receiver-Exciter	622-3387-()
HF-8070A Receiver-Exciter	622-3394-()

Note

Some configurations of these units have factory-installed 10-Hz tuning. To convert these units to 1-Hz tuning use AC-8018 10-Hz to 1-Hz Conversion Kit 622-3454-001.

2. INSTALLATION

Installation of AC-8019 100-Hz to 1-Hz Conversion Kit 622-3455-001 consists of replacing the existing frequency switchboard assembly with one from the kit, and configuring the synthesizer assembly for 1-Hz operation using two decade cards (100/10-Hz decades) supplied with the kit.

2.1 Frequency Switchboard Replacement

Note

Retain hardware removed during disassembly for use in reassembly. Refer to unit parts list as an aid in disassembly and assembly.

- a. Remove unit top cover.
- b. Remove front panel from unit by removing four hexhead screws and attaching hardware.

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during removal of upper overlay panel.

- c. Remove upper overlay panel from front panel as follows:
 1. Remove four Phillips-head screws and lockwashers that secure back of front panel to upper edge bar.
 2. Remove four Phillips-head screws and lockwashers that secure back of front panel to panel support (middle bar on front panel).
 3. Lift upper edge bar from front panel.

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4. Carefully remove upper overlay panel.
- d. Remove cover plate on back of front panel by removing five Phillips-head screws and attaching hardware (screwheads on front of front panel).
- e. Disconnect plug P2 from frequency switchboard jack A2J4.
- f. Remove frequency switchboard 635-0830-001 by removing four Phillips-head screws and attaching hardware (screwheads on front of front panel).
- g. Secure frequency switchboard 635-0830-002 supplied in kit to front panel using four Phillips-head screws and attaching hardware (screwheads on front of front panel).
- h. Connect plug P2 to jack A2J4 on frequency switchboard.
- i. Secure cover plate to back of front panel with five Phillips-head screws and attaching hardware (screwheads on front side of front panel).

Caution

Upper overlay panel (plexiglass) is brittle; exercise care during replacement of upper overlay panel.

- j. Insert upper overlay panel into slot on panel support (middle bar on front panel).
- k. Replace edge bar on top of front panel ensuring upper overlay panel fits properly.
- l. Secure upper overlay panel to front panel with eight Phillips-head screws and lockwashers.
- m. Secure front panel to unit with four hexhead screws and attaching hardware.

2.2 Configuring Synthesizer

2.2.1 Configuring Synthesizer Assembly 635-9697-001 for 1-Hz Operation

- a. Remove synthesizer assembly top cover.
- b. Remove END DECADE from A18 slot and install into the A16 slot.
- c. Install one decade card 623-2080-004 in the A17 slot and a second one in the A18 slot.
- d. Reinstall synthesizer assembly top cover.
- e. Reinstall unit top cover.

2.2.2 Configuring Synthesizer Assembly 634-8201-001 for 1-Hz Operation

- a. Remove synthesizer assembly top cover.
- b. Remove END DECADE from A19 slot and install into the A17 slot.
- c. Install one decade card 623-2080-004 in the A19 slot and a second one in the A18 slot.
- d. Reinstall synthesizer assembly top cover.
- e. Reinstall unit top cover.

3. REPAIR

Repair of the AC-8019 100-Hz to 1-Hz Conversion Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

4. PARTS LIST/DIAGRAMS

This paragraph assists in the identification, requisition, and issuance of parts, and in maintenance of the equipment. The Collins part number and description for each nonstandard replacement part are listed in table 2. These cards are covered in the following instructions which are included in this instruction book.

- a. Frequency switchboard (635-0830-001, -002) instructions (Collins part number 523-0767947).
- b. Synthesizer decade (623-2080-001, -002, -003, -004) instructions (Collins part number 523-0767972).

Table 2. AC-8019 100-Hz to 1-Hz Conversion Kit Parts List.

DESCRIPTION	COLLINS PART NUMBER	QUANTITY
Frequency switchboard	635-0830-002	1
Synthesizer decade	623-2080-004	2



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AC-8055 IF Filters Kit (622-3452-())

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AC-8055 IF Filters Kit
(622-3452-())

1. DESCRIPTION

AC-8055 IF Filters Kit 622-3452-() contains an if filter card and two sets of decals to mark the front-panel BANDWIDTH switch. When installed, the AC-8055 IF Filters Kit allows selection of one of eight filters using the front-panel MODE switch and BANDWIDTH switch. Normally, selection of specific filters is made in SSB/CW or AM modes. The if filter card is installed in the local unit and one set of decals is used to appropriately mark the front-panel BANDWIDTH switch of the local unit. The second set of decals is used to mark the front-panel BANDWIDTH switch on the associated control unit (if applicable). Refer to table 1 for equipment this kit is used on.

Table 1. AC-8055 IF Filters Kit, Equipment Used On.

EQUIPMENT	COLLINS PART NUMBER
HF-8050 Receiver	622-3385-()
HF-8050A Receiver	622-3393-()
HF-8054 Receiver	622-3474-()
HF-8054A Receiver	622-3475-()

Install adhesive-backed decals in front-panel recess at BANDWIDTH switch positions as shown in table 2.

2. INSTALLATION

Installation of AC-8055 IF Filters Kit 622-3452-() consists of installing an if filter card and front-panel decals.

2.1 Filter 637-2515-() Installation

- Remove top cover from unit.
- Remove A8 CHAN A IF from the unit.
- Plug filter into A8 CHAN A IF.
- Insert A8 CHAN A IF in its original position in unit.
- Reinstall unit top cover.

2.2 Decal Installation

Note

Extra decals in kit to be installed on associated control unit (if applicable).

3. REPAIR

Repair of the AC-8055 IF Filters Kit is accomplished using standard maintenance and planar card repair procedures. Refer to the maintenance section of this instruction book for planar card repair procedures.

4. PARTS LIST/DIAGRAMS

This paragraph assists in identification, requisition, and issuance of parts, and in maintenance of the equipment. The Collins part number and description for each nonstandard replacement part are listed in table 3.

Filter 637-2515-() is covered in Filter 637-2515-() instructions (Collins part number 523-0767967) included in this instruction book.

NOTICE: This section replaces first edition dated 1 June 1978.

Table 2. Decal Installation.

BANDWIDTH SWITCH POSITION	DECALS INSTALLED							
	KIT 622-3452-()							
	-001	-002	-003	-004	-005	-006	-007	-008
A	6	6	6	6	6	-	6	0.25U
B	3	-	3	3	3	-	-	0.7U
C	1	-	1	1	1	-	1	0.7L
D	0.5	-	0.5	0.5	0.5	-	-	0.25L
E	0.2	0.2	0.2	0.2	0.1	-	0.2	5.0

Table 3. AC-8055 IF Filters Kit Parts List.

PART DESCRIPTION	COLLINS PART NUMBER	QUANTITY USED ON							
		AC-8055 IF FILTERS KIT 622-3452-()							
		-001	-002	-003	-004	-005	-006	-007	-008
Filter	637-2515-001	1							
Filter	637-2515-002		1						
Filter	637-2515-003			1					
Filter	637-2515-005				1				
Filter	637-2515-006					1			
Filter	637-2515-010						1		
Filter	637-2515-011							1	
Filter	637-2515-013								1
Decal, 0.1	635-9700-001					2			
Decal, 0.2	635-9700-002	2	2	2	2			2	
Decal, 0.5	635-9700-003	2		2	2	2			
Decal, 1	635-9700-004	2		2	2	2		2	
Decal, 3	635-9700-005	2		2	2	2			
Decal, 6	635-9700-006	2	2	2	2	2		2	
Decal, 0.25U	646-6912-001								2
Decal, 0.25L	646-6912-002								2
Decal, 0.7U	646-6912-003								2
Decal, 0.7L	646-6912-004								2
Decal, 5.0	646-6912-005								1
Drawing envelope	520-8360-134	1	1	1	1	1	1	1	1
Installation Kit-IF Filters, AC-8055	622-3452-()	1	1	1	1	1	1	1	1

